

1895



1935

Used-Car Flood Worries Dealers

Unless Stocks Are Moved Rapidly, New Car Sales May Suffer During Spring

Stocks of used cars in the hands of automobile dealers in the larger cities of the United States are ominously high at the end of 1935, as compared with the end of 1934, and have begun to show definite repercussions on new-car sales efforts. These facts are evident from a survey undertaken this week by correspondents of Automotive Industries in the 25 most important trading centers, which shows 20 to 100 per cent rise in dealers' used-car stocks for the period reviewed, with sharp rises from Nov. 1 to date indicating that early introduction of 1936 models has been partially responsible for adverse conditions.

Many dealers, the survey shows, hope to liquidate present used-car stocks within the next 60 days, but view the possibility with uncertainty, in some cases tinged with alarm, and there are many other dealers who are unable to see ahead to the time when majority of used cars in hand will be sold.

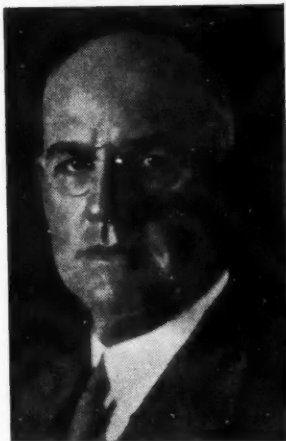
There is apparent, on the part of larger retailers, a tendency to devote more time to the used-car department, (Turn to page 845, please)

Olds and Fisher Lansing Plant Operations at Peak

Production, sales, employment and payrolls at the Olds Motor Works and adjoining Fisher Body plants in Lansing have reached a new all time peak this year, according to C. L. McCuen, president and general manager. The 1935 payroll of Oldsmobile and Fisher in Lansing will total \$16,443,234, as compared with \$10,535,435 in 1934. This exceeds the previous high mark established in 1929. Employment at the two plants has passed the 11,000 mark, the highest figure in history.

By the close of the year Oldsmobile will have produced 182,444 cars, which compares with 82,149 last year. Export sales this year total 12,522, while a year ago they were 5,707. Mr. McCuen pointed out that 53,000 new 1936 models have already rolled off the assembly lines. This figure is concrete evidence of better times when one considers the total production of only 17,500 in 1932, and 36,072 in 1933.

Taxes vs Pay Envelope



Alvan Macauley

Packard president, who called excessive taxation greatest threat to business and workers. . . . "No greater stimulus to recovery and no better method to bring about reemployment could be adopted than a mass movement of the American people against high costs of government," he said, in an address before 6000 Packard employees this week.

Studebaker Contracts With 77 New Dealers

Seventy-seven new dealers were granted franchises between Oct. 10 and Dec. 1, according to an announcement by George D. Keller, vice-president in charge of sales of the Studebaker Corp.

In This Issue

Safety in 1936 Automobiles	848
Tractor Industry Climbs Toward Renewed Prosperity	852
Measuring of Scavenging Efficiency in Two-Stroke Diesel Engines	858
International Uses Two-Speed Axle on Three New Truck Models	862

Holiday Let-Down Curtails Output

Year's Production Already Well Past Four-Million Mark

BY HAROLD E. GRONSETH

After reaching a new high on 1936 models, motor vehicle production was slowed down this week by holiday curtailment and will continue at irregularly lower levels through the balance of the month. The activity of the first three weeks, which approximated that of the spring months this year, however, indicates an output of close to 400,000 units for December and virtually assures realization of the latest AMA projection of 4,150,000 units for 1935.

The current year's production already has gone well over the 4,000,000 mark. December had only to account for 388,690 units to attain the new estimate for the year, since the final November figure brought the total for eleven months this year to 3,761,310 units. Last month's production of 411,520 cars and trucks in the U. S. and Canada, as reported by the Department of Commerce, established a new high for November by a wide margin and, with the exception of January of the boom year, 1929, represented the heaviest initial month's production of new models in the history of the industry.

All plants, of course, were idle on Christmas Day, and in a number of instances the closing was extended to include several days. Buick, Hudson

(Turn to page 845, please)

Bondall Co. Formed to Make New Brake Lining

The Bondall Co., St. Louis, Mo., has acquired 75,000 sq. ft. of plant space in a modern building, for the production of brake linings and clutch facings by a new process which has been undergoing extensive tests for the past four years. Production will begin early this year.

The Bondall Co. was organized by a number of prominent St. Louis business men, among them Charles A. Niemeyer, president of the company, who is a director of banks and other industrial enterprises, and C. C. Noel, who will be director of sales. Sales offices for the Bondall Co. will be established in leading cities of the country.

New Steel Plating Process Allows Use of Dyes in Aluminum Coating

A new process for coating steel articles with aluminum, to protect them against corrosive influences, has been developed by Professor Colin G. Fink, head of the Department of Electrochemistry of Columbia University, New York. It is analogous to the tin-plating and zinc-plating (galvanizing) processes, covering the steel article with a thin, uniform coating of aluminum by hot dipping. Heretofore it has been impossible to obtain an adhering coating of aluminum on steel articles in this way because of the readiness with which hot aluminum oxidizes, which prevented it from forming an adhering coating on steel. Professor Fink has overcome this difficulty by saturating the surface layer of the steel with hot hydrogen. This is claimed to result in a perfect bond between the steel base and the aluminum coating.

Steel articles in the past have been given a coating of aluminum by what is known as the calorizing process, which consists in packing the article in aluminum powder and subjecting it to a high temperature. This process, it seems, is applied mainly to steel parts that are subjected to high temperatures in service.

Articles treated by Professor Fink's aluminum-plating process have a smooth surface and can be given a special finish by the anodizing process. By this process the article to be treated is made the anode in an electrolytic bath, and when current is sent through

the bath a hard layer of aluminum oxide forms on the surface of the article. Aluminum oxide is an abrasive, and the coating therefore is very hard. Moreover, the oxide coating is formed from the base metal (the aluminum) itself and therefore cannot peel or flake off. By introducing a dye into the bath, the coating can be given any desired color. Either vegetable or mineral dyes can be used for the purpose. The coloring matter permeates the entire layer of aluminum oxide and therefore cannot wear off.

The process seems to be adapted particularly to sheet metal, wire gauze and wire. Ordinary steel-wire gauze, when exposed to a high temperature for any length of time, fails by corrosion. By aluminum-plating it, the resistance to corrosion at high temperatures is greatly increased, and the aluminum-plated gauze practically will not "burn through."

Professor Fink thinks that in automobile production aluminum-plated sheet (Alplate) is suitable for such parts as the hood and fenders, as well as other sheet-metal parts that are normally protected against corrosion by painting. The process, moreover, is likely to find wide application to steel structures where the steel is exposed to the atmosphere.

Reynolds Metals Company of Knoxville, Tenn., is the sole licensee for the exploitation of the process in the United States.

GM Gives \$25 to Each Worker for Christmas

An "Appreciation Fund" of approximately \$5,000,000 was authorized by the General Motors Corp. for distribution throughout its domestic divisions and subsidiaries on the day before Christmas. Every worker, and every staff member, except those eligible for the corporation's bonus fund, who was in the service of the corporation on July 1, 1935, will participate, each individual receiving \$25.

In announcing the good news, Alfred P. Sloan, Jr., president of the General Motors Corp., said:

"In extending my Christmas and New Year greetings to the operating staff, as well as the workers of the General Motors Corporation, I wish to acknowledge the loyalty and effectiveness with which the organization has met the difficult problems of the year now passing. As a result, important progress has been recorded and higher standards of operating technique have been brought about. And, with it all, there has been a materially greater contribution in the way of employment, with greater continuity and higher in-

come to the worker. And, still again, the corporation's products represent a still higher standard of value. Thus, the welfare of the entire community is promoted.

"All this, together with the better business conditions that have prevailed, both overseas as well as domestically, has resulted in a better year for all of us in General Motors, from all counts, than has been the case for several years past."

Netherlands Treaty Binds Duties at Present Levels

Latest of the reciprocal trade agreements to be concluded is that with the Netherlands, made public Dec. 23 by the State Department, and which will become effective Feb. 1, 1936. Automotive items will be affected as follows:

Duties will be bound at present rates on imports into the Netherlands of automobile casings and inner tubes (12 per cent ad valorem); passenger cars, commercial vehicles, internal combustion engines for automobiles and tractors, tractors, chassis and chassis frames for automobiles and tractors (15 per cent ad valorem), and lubricating oil (free).

Duties on imports into the Netherlands Indies will be bound as follows: automobile casings and tubes, 18 per cent; internal combustion and explosion motors and parts for automobiles of all kinds, 30 per cent; passenger automobiles, 30 per cent; motor trucks and buses, 18 per cent; automobile chassis and parts for trucks and buses, 18 per cent; parts for passenger cars, 30 per cent; automobile accessories, 30 per cent.

The agreement is to continue in force until Jan. 1, 1939, unless terminated by either country upon six months' notice. Like the previous reciprocal agreements, the Netherlands-United States treaty will provide for unconditional and unrestricted most-favored-nation treatment.

NLRB Gets United Air Labor Dispute

Unfair Lay-offs of Union Workers Charged Against Company's Subsidiaries

Edwin T. Smith, trial examiner for the National Labor Relations Board, has submitted an intermediate report to the board charging that the Pratt & Whitney and Hamilton Propellers Division of the United Aircraft Manufacturing Corp., East Hartford, Conn., has engaged in unfair labor practices through the discriminatory lay-offs of 18 union workers, members of Industrial Aircraft Lodge No. 119, an affiliate of the Federation of Metal and Allied Unions. Recommendation was made that the company cease and desist from interfering with the workers' right to concerted action through their union and that it offer immediate reinstatement, with back pay and former privileges, to the 18 men. The company was given five days in which to comply with the recommendation. Otherwise, it was stated, the matter will be referred to the labor board and an order issued requiring action.

It is stated that lay-offs occurred immediately after a protest stoppage of work which happened in both plants simultaneously on Sept. 16. A four-day hearing was held in November. The first work stoppage occurred in May, 1935. The report said that the company and the union then agreed on a procedure of discussion of mutual problems for the routing of grievances upward through shop committees to the president of the company, Donald R. Brown, in case the matter could not be settled lower down. Testimony, according to the report, indicated the union was frustrated in its attempt to confer with Mr. Brown at a time when rumors were circulated that "the company was going to crack down on the union very shortly."

From this failure to confer with the company president, which led directly to the work stoppage on Sept. 16, the report concluded that "the company

was not disposed to settle the question of lay-offs by means of the procedure for negotiation established in May." After wholesale lay-offs on this date, it was stated, the company hired back its workers individually on approval by foremen. It was stated that a union request to be rehired in a body was denied.

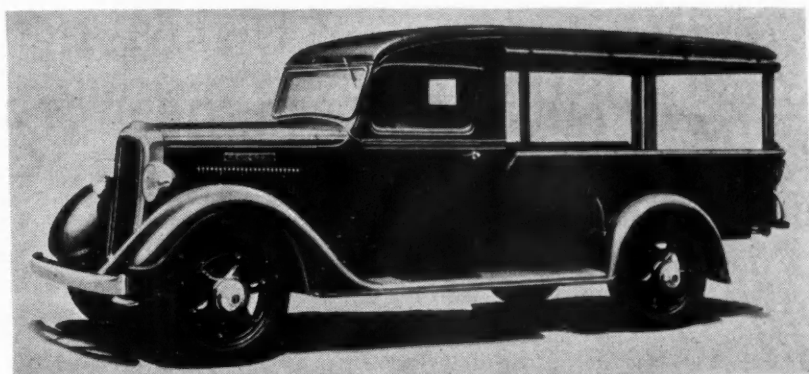
Included among the 18 men who were laid-off were the president and treasurer of the union, five members of the union executive committee and other key union officials, the report said. The majority of them were highly skilled workers.

The report said the United Aircraft Corp. leads the world in the production of airplanes, airplane engines, propellers and parts. Both the engines and propellers are used extensively by the United States Army and Navy and by practically all of the domestic commercial air lines.

Maurice Wolfe

Maurice Wolfe, president and general manager of the Meteor Motor Car Co., Piqua, Ohio, died suddenly at his home on Dec. 13. Mr. Wolfe had been in failing health for some time, but his death came suddenly following a cerebral hemorrhage.

Maurice Wolfe was born at Rosewood, Ind., May 16, 1876. He organized the Meteor Motor Car Co., at Piqua, in December, 1913, for the purpose of making passenger automobiles. Since



Federal Model 10 1/4-ton truck with flare-board open express body.

1915, his company has become outstanding in the production of hearses and ambulances. Mr. Wolfe was the first to place on a mass production basis these vehicles which had previously been custom built.

Mr. Wolfe is survived by his widow, a brother, Clarence P. Wolfe, of New Harmony, Ind., and a sister, Miss Emma Wolfe, of Hollywood, Calif. He was a member of the Piqua Rotary and Piqua Country Clubs, and of the Piqua Lodge of Elks.

Toledo Synthetic Products, Inc., makers of Plaskon urea molding material, announces that the name of the company will be changed on Jan. 1, 1936, to Plaskon Co., Inc.

Low Finance Rates Seen for Used Cars

Breaking of Old-Model Jam Would be Helped by Lowering Credit Costs

The strong probability exists that installment financing rates on used cars will be reduced soon after Jan. 1, according to executives of leading companies.

Such a development will aid in moving stocks of used cars, which are large, and will clear the way for new car commitments by dealers as well as enable them to take in the usual spring trades. It is also stated that the public is entitled to savings on used car financing just as it recently secured reductions on new car rates. Low interest charges and lower unit handling costs, due to larger volume, were factors in the new car action by the finance companies, and will be the basis for the used car rate cuts, it is said.

The disparity between the cost of financing used and new cars is working to the detriment of used car sales, it is said. Purchasers calculate the financing costs, and frequently take new cars instead.

Used car financing rates have been higher than new car rates for several reasons. Insurance rates are lower on used cars, and where the financing companies cannot make a profit through insurance brokerage, they have had to charge more for financing the unpaid balance of the purchase price as an offset.

Another reason for the higher cost of financing the unpaid balance on a used car is the generally lower quality of the credit risk and the fact that such credits are ordinarily shorter than new car credits. The finance companies also claim that repossession and expense of handling used cars are higher than on new ones.

The task of calculating a new basis for used car financing is complicated by the great number of insurance territories and by the lack of uniformity of the merchandise. Company executives

(Turn to page 842, please)

Shows During November Raised Month's Production to 411,520

Changed buying habits and an insistent retail demand for 1936 models reflected themselves graphically in the November production of passenger cars and trucks in the United States and Canada. Output for last month climbed nearly five times over the level for the corresponding month of 1934, the low point, production wise of that year and approached double the volume for October. Total output for November was 411,520 units which compares with 85,179 for the same month one year

ago and 283,334 for October.

That earlier predictions of a 4,000,000 unit year for 1935 will be attained is borne out in the 11 months' total for the current year. At November's close the grand total stood at 3,761,310 units for this country and Canada; this compares with 2,713,645 for the preceding comparable period of 1934. When December's output, currently estimated at about 300,000, is added to the January-November volume the projected total will be an actuality.

Passenger Car Production—U. S. and Canada

	November, 1935	October, 1935	November, 1934	Eleven Months, 1935	Eleven Months, 1934
Passenger Cars—U. S. and Canada:					
Domestic Market—U. S.	314,566	195,568	.....	2,720,837	.....
Foreign Market—U. S.	23,859	19,041	.....	220,386	.....
Canada	12,042	7,128	1,052	128,372	90,204
Total	350,467	221,737	50,072	3,069,595	2,157,062
Trucks—U. S. and Canada:					
Domestic Market—U. S.	49,427	47,111	.....	522,605	.....
Foreign Market—U. S.	10,172	13,301	.....	138,262	.....
Canada	1,454	1,185	645	30,848	23,954
Total	61,053	61,597	35,107	691,715	556,583
Total—Domestic Market—U. S.	363,993	242,679	.....	3,243,442	.....
Total—Foreign Market—U. S.	34,031	32,342	.....	358,648	.....
Total—Canada	13,496	8,313	1,697	159,220	114,158
Total Cars and Trucks—U. S. and Canada	411,520	283,334	85,179	3,761,310	2,713,645

New Car Registrations Up 46% In Nov.—Double Last Year's Figures

New passenger car registrations amounted to approximately 216,000 units for November, as compared with 107,648 during November a year ago and 148,389 in October of this year, according to estimates based in returns from 39 states. This is an increase of 101 per cent over November, 1934, and a gain of 46 per cent over October of this year. As compared with all preceding Novembers it is the highest for the history of the industry, and as compared with the previous first month of new car announcements, which in the past has been January, it is better than any January with the exception of 1929.

During the first eleven months of this year, 2,502,500 new cars were registered, as compared with 1,705,627 during the same period last year, an increase of about 47 per cent.

If the same ratio is maintained for

the states which have not reported as yet, Ford and Chevrolet will run approximately the same for the month, with an estimated total of 56,000. Plymouth stays in third place with a total of approximately 29,600. Chevrolet is showing a gain over November, 1934, of 51 per cent, Ford 141 per cent and Plymouth of 120 per cent.

Based on returns from 41 states, new truck registrations for November are estimated at 37,000 units, as compared with 28,689 during November, 1934, and 43,243 during October of this year. This is an increase of 29 per cent over a year ago, but is a decrease from October, 1935, of approximately 14 per cent. On the basis of this estimate 11 months' return for 1935 will show an increase over the same period of 1934 of about 26 per cent, registrations amounting to 479,000, as against 379,816 during 11 months of 1934.

Knudsen Says Used Car Problem Worst

Demand for New Cars Must Be Governed by Wearing Out of Old, Says GM Head

Billed as an address on the subject of "Manufacturing," William S. Knudsen's talk before the Detroit Engineering Society last week developed into a delightful bit of reminiscence about the spectacular career of a Danish lad who rose to be the manufacturing head of the General Motors Corp. J. H. Hunt, G. M.'s new devices committee head, served as chairman.

Mr. Knudsen drew upon his own experiences to picture the almost fantastic development of the automotive industry from its humble beginnings to its present position. It took mass production to really force improvements that made the motor car a useful and dependable means of transportation, because quantity production brought out the shortcomings in design. Things had to be smoothed out before the production process could be carried on economically, and the car buyer, as well as the industry, profited thereby.

The birth of mass production brought engineering and research into an industry that had thrived on the practical man's cut-and-try methods. Into this picture also came the machine tool manufacturer whose inventive genius played a big role in the development of the present manufacturing techniques.

Mr. Knudsen rounded out his talk by touching upon some of the pressing problems of the industry. In this category he gives the used-car problem first place. The late unlamented codes failed because the customer could not

be convinced that his old car was worth only scrap value when traded against a new car. The technique of the future should be to let obsolescence control, to gear production to replacement, and let the demand for new cars be governed by the wearing out of the old.

The attempt at leveling out the peaks and valleys in employment is one of the most important activities in the management field. At present it is largely experimental, and the problem is exceedingly difficult of solution because of the ingrained buying habits

of the public. It is too early to appraise the effects of the early introduction of new models and much depends upon the volume of spring buying which is uncertain at the moment.

As to future trends, Mr. Knudsen feels that the biggest objective is that of more and more value for the customer's dollar. Already the new cars in the low price field have all the features of high priced cars except that of size, and that process will continue, if business is to be stimulated and maintained.

S.A.E. Forms Section In Hartford District

An additional section of the Society of Automotive Engineers, to be known as the Southern New England Section, has been organized with Frank P. Gilligan, secretary and treasurer, Henry Souther Engineering Corp., Hartford, as chairman. The section will draw its membership from an area within approximately a 50-mile radius of the city of Hartford. The first meeting is scheduled for the Bond Hotel, Hartford, Jan. 16, 1936.

Other officers are: Arthur T. Murray, president, United American Bosch Corp., Springfield, Mass., vice-chairman; T. C. Delaval-Crow, chief engineer, New Departure Mfg. Co., Bristol, Conn., treasurer, and E. P. Blanchard, sales manager, Bullard Co., Bridgeport, Conn., secretary.

Two S. A. E. Regional Meetings have been held previously in Hartford. Attendance at each, averaging 250, indicated need for a regular section organization.

Independent Union Combine Voted at Detroit Meeting

Merger of independent unions in the motor industry into the new Automobile and Metal Workers' Industrial Union was assured at the constitutional convention in Detroit last weekend, although organization was not entirely completed. A second convention has been called for Feb. 1, to act on certain provisions of the constitution which were left open for further discussion and revamping by committees appointed to iron out various details.

At the next meeting, permanent officers will be elected, the name formally adopted and arrangements made for establishment of headquarters. Temporary headquarters have been set up in the offices of the Mechanics Educational Society which, with the Associated Automobile Works of America, forms the backbone of the new union.

Only one of the 26 locals of the Automotive Industrial Workers Association, that at the Motor Products plant, finally decided to go along with the

merging independents at this time, although leaders in the movement are hopeful eventually of getting a larger following from that organization. Officers of the Dodge Pressed Steel local of the AIWA attended the convention. Members of the AIWA who defied their central officers in uniting with the new union were promptly expelled from the AIWA.

Dues for the new union were established at 50 cents a month for workers earning up to 50 cents an hour, and \$1.00 a month for those earning more than 50 cents an hour.

Moral and financial support was voted strikers at the Motor Products plant, but no sentiment was in evidence for extending the strike to other plants. Nothing has developed to further the cause of the strikers. The "sit-down" policy* of the AFL local, voted as a protest against the management and in support of the independents who first walked out, has been ineffective, and is reported to have been

only partially carried out by members. About half of the AFL members are understood to be still working and the remainder has joined the ranks of the strikers. Father Coughlin, who has sponsored the AIWA, despatched a telegram to Secretary of Labor Perkins, requesting that Assistant Secretary of Labor McGrady come to Detroit to mediate, but as yet no reply has been received.

* A "sit-down" is construed in organized labor ranks as a sympathy move of purely local action supporting striking workers. The men on the "sit-down" report for work, enter the plant, but perform no duties.

DePaolo Will Travel for Thompson Products, Inc.

Peter De Paolo, internationally known automobile race driver, has joined Thompson Products, Inc., Cleveland, as a sales engineer and will tour the country during 1936 addressing repair trade audiences, according to an announcement by Tom O. Duggan, merchandising director of the parts manufacturing concern.

De Paolo will appear at meetings sponsored by jobbers and featuring the company's new sound picture "Speeding Up." He will travel in a specially built sedan carrying the film equipment. As door prizes at the meetings, De Paolo will present autographed copies of his recently published book "Wall Smacker," an intimate personal story covering the personalities and history of automobile racing.

Macauley to Broadcast New Year's Greetings

Alvan Macauley, president of the Packard Motor Car Co., will broadcast New Year's greetings to listeners in the United States and foreign countries when he speaks on a special international program at 8.30 p. m. Dec. 31. The program will be broadcast over the Columbia network in this country, and rebroadcast by short-wave to listeners abroad. Lawrence Tibbett will sing folk melodies of seven leading nations, accompanied by Don Voorhees and the concert orchestra.

Correction

In an obituary notice on Eugene Bournonville, which appeared in our Dec. 14 issue, it was stated erroneously that the Davis-Bournonville Co. had been absorbed by the Union Carbide and Carbon Co. The company is actually one of the operations of the Air Reduction Sales Co.

Lewis Wells

Lewis Wells, assistant manager of the Fisher Body plant No. 2, at Flint, Mich., died at his home in Flint last Sunday.

Kentucky collected \$80,000 more in Gasoline taxes in October this year than in the same month last year, according to figures released by the State Tax Commission. In October this year, the state collected \$927,393.19.

Preliminary Facts and Figures of the Automobile Industry in 1935

From the Automobile Manufacturers Association

Production and Value		
	1935	1934
Cars and trucks produced in U. S. and Canada.....	4,150,000	2,869,963
Passenger cars	3,400,000	2,270,566
Motor trucks	750,000	599,397
Production, percentage increase over 1934.....	45%	44.5%
Production of closed cars.....	3,360,000	2,242,874
Per cent of closed cars.....	99%	99%
Wholesale value of cars	\$1,797,800,000	\$1,204,376,351
Wholesale value of trucks	\$388,700,000	\$332,913,985
Wholesale value of cars and trucks combined.....	\$2,186,500,000	\$1,537,290,336
Average factory price of cars.....	\$705	\$662
Average factory price of trucks.....	\$691	\$696
Number of tires shipped	50,000,000	46,600,000
Wholesale value of parts and accessories for replacements, and service equipment	\$565,000,000	\$514,000,000
Wholesale value of rubber tires for replacement.....	\$248,000,000	\$238,497,000
Motor vehicles, accessories, service equipment and replacements of parts and tires.....	\$2,999,500,000	\$2,289,787,336
Gasoline consumption by motor vehicles, retail value including taxes	\$3,260,000,000	.....
Registration		
Motor vehicles registered in U. S.	26,000,000	24,933,403
Motor cars	22,450,000	21,524,068
Motor trucks	3,550,000	3,409,335
World registration of motor vehicles	36,500,000	35,087,698
Per cent of world's automobiles in U. S.	71%	71%
Passenger cars on farms	4,134,675	4,134,675
Motor trucks on farms	900,385	900,385
Motor vehicles on farms	5,035,060	.....
Taxes		
Total motor vehicle user taxes.....	\$1,288,000,000	1,200,107,729
Gasoline taxes, federal, state and municipal.....	\$804,500,000	.....
Percentage motor user taxes to all taxes from all sources, federal, state and local.....	13%	.....
Automobile's Relation to Other Business		
Automotive industry is the largest purchaser of gasoline, rubber, steel, malleable iron, mohair, upholstery leather, lubricating oil, plate glass, nickel and lead.		
Number of carloads of automotive freight shipped over railroads	3,422,000	3,064,800
Rubber used by automobile industry	75%	75%
Plate glass used by automobile industry.....	77%	70%
Steel and iron used by automobile industry.....	23%	23%
Lumber, hardwood, used by automobile industry.....	8%	8%
Copper used by automobile industry	22%	18%
Lead used by automobile industry	39%	38.8%
Zinc used by automobile industry	15%	12.2%
Tin used by automobile industry	20%	13.3%
Aluminum used by automobile industry	16%	15%
Nickel used by automobile industry.....	33%	29.6%
Gasoline consumption by motor industry.....	89%	89%
Gasoline used by motor vehicles (gallons).....	16,150,000,000	15,300,000,000
Lubricants used by motor vehicles (gallons).....	485,000,000	.....
Lubricants, percent used by motor vehicles.....	59%	.....
Crude rubber used by motor industry (lbs.).....	885,000,000	718,000,000
Cotton fabric used in tires (lbs.).....	210,000,000	202,000,000
Motor Trucks		
Motor trucks in use	3,550,000	3,409,335
Number of trucks owned by farmers (25% of all trucks).....	900,385	900,385
Fleets of more than 5 trucks, number of operators.....	28,035	25,975
Number of trucks operated in fleets	780,000	771,941
Total motor truck taxes	\$314,000,000	\$308,828,000
Trucks represent 13½% of all motor vehicles, and pay 24% of all motor taxes.....	13½% and pay 26.7% taxes	.....
Number of truck drivers	2,500,000	.....
Communities served exclusively by trucks.....	48,000	.....
Motor Buses		
Motor buses owned	116,500	113,130
Number of buses in revenue service.....	45,000	43,000
Number of buses in local or transit service.....	18,380	17,580
Consolidated schools using motor transportation.....	23,650	23,580
Buses used by consolidated schools	70,500	70,130
Buses used by street railways	12,600	11,570
Street railways using motor buses	190	199
Companies in city service including street railways.....	825	.....
Steam railroads using motor buses.....	65	71
Foreign Sales		
Number of American motor vehicles sold outside U. S. (U. S. exports and output in U. S. owned Canadian plants).....	565,000	427,374
Per cent increase in foreign sales over 1934.....	32%	.....
Per cent of production sold outside U. S.	13.6%	14.9%
Value of motor vehicles, parts and tires exported from U. S. and Canada	\$239,000,000	\$214,291,313
Motor Vehicle Retail Business in U. S.		
Total car and truck dealers.....	39,400	37,238
Total repair shops	98,169	99,538
Total retail outlets, duplications eliminated.....	105,330	105,991
Wholesalers	5,932	5,757
Retail gasoline outlets	320,000	.....

Low Finance Rates Seen for Used Cars

(Continued from page 839)

tives doubt at the present time that any such simple basis can be set-up as was recently announced for new car financing.

The position of automobile dealers under the new set of conditions imposed by fall shows is of special significance just now. It has been widely forecast that unduly large used car stocks for this season of the year, due to fall shows and heavy new car sales in November and December, will result in a large dealer financial mortality this winter. On the other hand, it is pointed out in some quarters that dealers who never made any money in the fall when January shows were the rule did make money this year, and are, therefore, in a better position to carry used car stocks than in prior seasons.

Whether the change in announcement dates for new cars will have the effect of bringing a change in used car sales peaks cannot be seen as yet. The used car season usually begins about March 1. If, due to the quality of the used car stocks, sales begin earlier, or are larger when they do begin, the problem will be minimized. If not, the automobile companies will probably have some difficulty finding dealers with sufficient resources to handle 1936's in the spring and still carry along unsold stocks of used cars. A complicating feature this winter is the large proportion of almost new used cars, 1935's and late 1934's, turned in on new models to an extent rarely seen in recent years.

Tennessee Jobbers Charged With Price Fixing by FTC

In a complaint issued by the Federal Trade Commission, the Chattanooga Automotive Jobbers Association, of Chattanooga, Tenn., and the Tennessee Automotive Jobbers Association, of Knoxville, Tenn., and their officers and members, are alleged to have entered into agreements, combinations, understandings and conspiracies to fix and maintain uniform prices to be exacted by them from purchasers of automobile parts and accessories. The members of the respondent associations are charged with attempting to restrict sales of such parts and accessories by manufacturers to and through jobbers.

Pursuant to the alleged agreements and understandings, the respondents are charged with having engaged in the following practices:

- (1) Abiding by manufacturers' resale schedules in the selling of certain automobile parts and accessories;
- (2) Fixing prices at which such articles should be sold;
- (3) Fixing prices for repair jobs in-

volving both automobile parts and labor;

(4) Fixing or maintaining schedules of discounts to be allowed by them to certain classes of purchasers of automobile parts and accessories;

(5) Requiring certain classes of their purchasers to resell parts and accessories purchased from members at the list prices of the manufacturers thereof, or at prices fixed by the respondent associations;

(6) Classifying customers and imposing certain requirements on parts and accessories manufacturers to enforce black-listing and boycotting of their customers as well as the manufacturers wherever the customers' or manufacturers' policies or practices are not in accord with the association members' agreed policies and trade practices.

The respondents are given until Friday, Jan. 24, 1936, to show cause why the Commission should not issue an order to cease and desist from the practices alleged.

Harold E. Larsen

Harold E. Larsen, Pacific Coast representative of the Timken-Detroit Axle Co., died Nov. 20 at his home in San Mateo, Calif., after an illness of several months. Mr. Larsen had been on the coast for six years. Previous to that time he was special field engineer and covered the entire country in that capacity for two years.

Mr. Larsen was very active as a member of the Northern California section of the Society of Automotive Engineers.

Faulkner Gives Auburn Officers Stock Options

Roy H. Faulkner, president of the Auburn Automobile Co., has voluntarily given to a group of 26 officers and executive employees of the company part of the option he received from the company in August, 1934, for the purchase by him of 5000 shares of its stock at \$25 a share, the then market price. Mr. Faulkner retains an option to buy 1500 shares and has also reversion rights on the options he has given to the group, in the event that any of the individuals leave the employ of the company. Disclosure of the gift was through the registration application of the company with the Securities and Exchange Commission filed when the company sought authority to issue new bonds. Those receiving the options were not named.

The explanation given in the registration form said Mr. Faulkner believed that other executives and employees actively engaged in assisting him to place the business again on a profitable basis should share in the benefits of the option. Mr. Faulkner has already renewed his service contract for the year to end next November and may renew it for another year according to its terms.

The registration statement also showed that the Cord Corp. owns 43,218 shares of Auburn stock or 19.25 per cent of the outstanding issue.

The regular quarterly cash dividend on 162,500 shares of stock outstanding was recently declared by the board of directors of The Perfect Circle Company. The dividend amounting to 50 cents a share is payable January 1, 1936, to stockholders as of record December 17, 1935.

API Petroleum Reserves Estimate Proves Shortage Fears Groundless

A shortage of petroleum in the United States is still far away, according to the latest estimates of the American Petroleum Institute's special committee on production and supply. Proved underground reserves of oil in known fields are estimated at more than 12,177,000,000 barrels in a book reviewing progress in the petroleum industry to be published soon by the Institute.

This estimate covers only petroleum which may be extracted by ordinary current methods of production under prices prevalent on Jan. 1, 1935, the date of the estimate. It does not include an indeterminate quantity left in the ground by present producing methods, but recoverable by advanced methods of production such as water drive, and at prices higher than those now prevailing.

Numerous reliable sources supplied the figures on which the estimate is based. Particular weight has been given to the opinions of experts familiar with the various oil producing

fields and districts. Texas has the largest proven reserve amounting to 5,500,000,000 barrels. California comes next with 3,500,000,000 barrels and Oklahoma is third, with 1,200,000,000 barrels. A few states with known, but small, reserves were omitted from the compilation.

Following are the estimated reserves in known fields as of Jan. 1, 1935, by states:

	Bbl.
California	3,500,000,000
Wyoming	250,000,000
Montana	60,000,000
Colorado	12,000,000
New Mexico (S.E.)	350,000,000
Texas	5,500,000,000
Oklahoma	1,200,000,000
Kansas	400,000,000
Arkansas	75,000,000
No. Louisiana	55,000,000
Coastal Louisiana	350,000,000
Illinois	35,000,000
Indiana	5,000,000
Kentucky	35,000,000
Michigan	45,000,000
New York	40,000,000
Ohio	30,000,000
Pennsylvania	240,000,000
West Virginia	25,000,000
Total United States	12,177,000,000

Motor Orders Alone Uphold Steel Output

Full-time Employment Expected to Delay Price Increase Until April 1

Undismayed by the leading interests' adherence to prevailing prices in the booking of first quarter business and the falling in line of other steel producers, those who have been predicting advances in flat steel prices have moved the effective date of their prophecies forward to April 1. They argue that higher wage scales for mill workers will be forced upon the industry before long and that price advances will then become inevitable. As against this view of the outlook it is pointed out that steel producers as well as mill workers will profit more at this time from adequate volume of demand than they would from a slight advance in prices, full-time employment being more important to mill operatives than a boost in the hourly pay scale. Moreover, the emphasis that is being laid on the improvement in demand from automotive consumers tends to distort the picture of the steel industry as a whole.

Ingot production in 1935 will amount to approximately 34,000,000 tons. This denotes an improvement by about 30 per cent over the preceding year and of 2½ times the output of the worst of the depression years, 1932. At the same time, ingot production in normally good years ran at the rate of about 45,000,000 tons, so that recovery has only been partly attained this year.

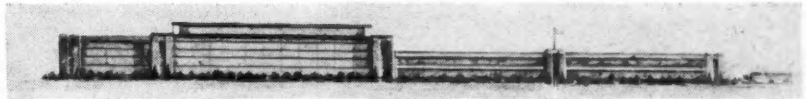
While automotive consumption of steel has made a spectacular showing, latest reports of the National Association of Flat Rolled Steel Manufacturers showing sales in November to have been virtually on a parity with capacity, there remains much room for improvement in the takings of steel by other industries. Demand for structural steel is still backward. Railroads are not taking anywhere near their usual quota of the steel production. Automotive consumption, especially so when, in addition to the steel that goes into motor cars and trucks, the heavy quantities absorbed in the making of automotive machine tools, etc., are taken into consideration, continues to furnish the principal support of the steel industry, a condition that no one in the steel market expects to change in 1936.

Pig Iron—Rail shipments to automotive foundries make up an important part of the current pig iron movement. Prices are unchanged all along the line.

Aluminum—The market for primary aluminum closes the year without a single price change having been noted throughout 1935. There were minor fluctuations in the market for secondary aluminum and alloys, chiefly due to the ups and downs in the supply of scrap.

Copper—December bookings by copper producers are running considerably ahead of November, with the probability that 1935 sales will aggregate in the neighborhood of 600,000 tons, denoting the heaviest consumption since 1930. The market is unchanged at 9¼ cents, delivered Connecticut.

Stampings for GM passenger car bodies will be made in the new plant at Grand Rapids, Mich., which is now under construction at a cost that may exceed \$7,000,000. Del S. Harder, who will be the resident manager of the new plant, is shown at the right.



Tin—Under the influence of threats of a coal strike in England, the London market was unsettled, while here dullness reigned. Spot Straits was quoted on Monday at 48½ cents, ¼ cent lower than at the close of the preceding week.

Lead—Steady and unchanged.

Zinc—Dull and unchanged.

Willis Now Operating Miami Beach Hotel

George E. Willis, formerly a vice-president of the Pierce-Arrow Car Company, Buffalo, N. Y., and at one time director of foreign sales for Studebaker, is now engaged in the hotel business at Miami Beach, Fla. Mr. Willis is the owner of the new Barclay-Plaza Hotel, Park and Washington Avenues, which opened for business Dec. 2.

40 Years Ago

—with the ancestors of
AUTOMOTIVE INDUSTRIES

At some future day, when roads are universally good and motor vehicles are no longer a novelty; when people are accustomed to managing them and taking them into account as a factor of danger in street life, high rates of speed will be permissible where road conditions are favorable; but for the present it is neither necessary nor desirable. Legal measures limiting the speed of motor vehicles are as much needed as measures regulating the speed of bicycles and horse-drawn conveyances, and for the same reason, namely, the public safety.—*The Horseless Age*, December, 1895.

Alarmed by reported wholesale defections from the union workers at the Chevrolet plant Wednesday held a "Save the Union" demonstration.

Whitney Mfg. Co. Will Change Corporate Name

The Whitney Mfg. Co. of Hartford, Conn., manufacturers of roller, silent, block and conveyor chains and sprockets for the past 35 years, will change its corporate name on Jan. 1, 1936, to the Whitney Chain and Mfg. Co. No change in company policy or product will be involved.

Knudsen to Address ASTE

William S. Knudsen, executive vice-president of General Motors Corp., will be the guest speaker at the monthly dinner meeting of the American Society of Tool Engineers, to be held at the Fort Shelby Hotel, in Detroit, Jan. 9, 1936. R. Lippard, president of the A.S.T.E., will be chairman and toastmaster of the meeting.

LOF-Union Negotiations

Wage negotiations between Libbey-Owens-Ford Glass Co. and Flatglass Workers Federation are reported to be progressing harmoniously.

Briefs from the News

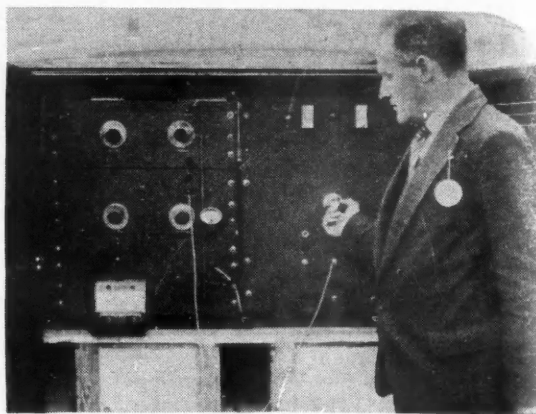
Many of the 1936 cars are using Durez 2491 for distributor rotors and coil caps. This new molding material has been developed by General Plastics, Inc., North Tonawanda, N. Y., to meet the demand for a material having a high dielectric breakdown. According to recent A.S.T.M. tests, Durez 2491 has a dielectric breakdown of 550 V/M. and a dielectric fatigue of 400 V/M/M.

Mrs. Illa Kirn, oldest employee of the B. F. Goodrich Co., who started to work for the company's founder, Dr. Benjamin Franklin Goodrich 47 years ago, has retired from the company. David M. Goodrich, chairman of the Goodrich board and son of the company's founder, made a special trip from New York to Akron to attend a farewell reception given for Mrs. Kirn by Goodrich officials.

The Briggs Manufacturing Co. has declared an extra dividend of 50 cents. On Oct. 31 a similar extra dividend was paid.



European



Driver in recent Ulster Trophy race received pit messages broadcast from transmitter in a strategically placed truck.

Engineer Graef drives in Vienna's Concours d'Elegance car he built in 1897—a one-cylinder, front-wheel drive.



Wide World

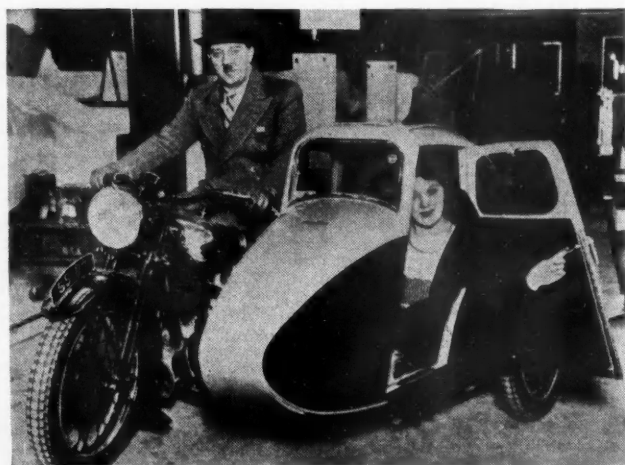
The WORLD on WHEELS

Sheffield, England, motorists must consult calendar before parking.

The London climate should be blamed for this latest model side-car.



European



Medium Priced Classes Lead in Gains During First 11 Months

Passenger Car Production by Wholesale Price Classes
(U. S. and Canada)

Eleven Months, 1935 and 1934, Compared

	1935	1934	Per Cent Change	Per Cent of Total	
				1935	1934
\$500 and under.....	1,812,408	1,419,081	+28.0	59.05	65.79
\$501-\$750	1,121,697	634,014	+77.2	36.54	29.39
\$751-\$1,000	95,284	61,969	+54.1	3.10	2.87
\$1,001-\$1,500	25,186	25,620	-1.7	.82	1.19
\$1,501-\$2,000	8,089	7,903	+2.2	.26	.37
\$2,001-\$3,000	4,861	6,499	-25.1	.16	.30
\$3,001 and over.....	2,070	1,976	+4.9	.07	.09
Total.....	3,069,595	2,157,062	+42.3	100.00	100.00

Truck Production by Capacities
(U. S. and Canada)

Eleven Months, 1935 and 1934, Compared

	1935	1934	Per Cent Change	Per Cent of Total	
				1935	1934
1½ tons and less.....	649,364	514,724	+26.3	93.88	92.48
2 to 3 tons.....	32,298	33,966	-4.8	4.67	6.10
3½ tons and over.....	5,845	5,823	+0.2	.84	1.05
Special and buses	4,208	2,070	+103.0	.61	.37
Total.....	691,715	556,583	+24.2	100.00	100.00

Reo Workers Average Long Service Records

Twenty-seven per cent of the factory force of the Reo Motor Car Co. have been with the firm for 15 years or longer, Donald E. Bates, president, said at Lansing this week. He also pointed out that 44 per cent have been with Reo for 10 years, and 67 per cent for more than five years.

A factory survey also disclosed that 90 per cent of the employees were born in the United States, and five per cent in Canada and other English-speaking nations, leaving only five per cent in non-English speaking countries. "Of further interest," Mr. Bates said, "is the fact that 55 per cent of the Reo factory workers owned or were buying their homes on Dec. 1, this year, which is more impressive in view of the five and a half years of economic depression from which we are now emerging."

Buckman May Get Civic Post

Herbert Buckman, since 1922 secretary of the Cleveland Automobile Dealers Association, will be asked to become commissioner of the public hall and stadium in Cleveland, according to Ohio newspapers. This report has been neither confirmed nor denied by Mr. Buckman.

Westinghouse Mfg. Co. to Celebrate Its 50th Year

In connection with its fiftieth anniversary, to be celebrated officially on Jan. 8, the Westinghouse Electric and Mfg. Co. recalls that the first Diesel-electric railcar in the United States was built by the company in 1929. Another automotive development in the

company's history was the building of an automobile parking machine in 1931, by which cars are parked one above the other on cradles, so that 144 cars can be parked on the space usually required for 24.

Holiday Let-Down Curtails Output

(Continued from page 837)

and Chevrolet were shut down only on Wednesday. Plymouth, Dodge and Packard closed Tuesday afternoon, and reopened Thursday. Olds resumed Thursday after being down the first half of the week. Pontiac and Hupp remained closed from Wednesday through the balance of the week. Graham operated only Monday and Friday. Production lines at Ford Motor Co. and Cadillac-LaSalle suspended Christmas Day and are to resume January 2. Ford customarily takes advantage of the holiday week to take inventory, and this year the suspension of assembly operations per-

mits the company to even up stocks at branches. Since a number of departments are operating, and at least one-third of the force is employed between the holidays, several plants are planning to take more than New Year's Day next week.

In the opinion of sales executives, the next few weeks will provide a critical test of retail demand. Christmas buying, which has been such a big factor this year in December sales, is now over. The market is farther removed from the stimulus of new model introductions and weather conditions will be at their worst as an influence on sales. The peaking up of used car stocks has tended to make dealers more cautious in trading. Altogether, there are a number of hurdles ahead for new car sales to overcome, and the relative ease or difficulty with which these are cleared will provide an important clue to the trend in 1936.

Used-Car Flood Worries Dealers

(Continued from page 837)

and cut prices loom as the answer to many a dealer looking ahead to the Spring market.

The current market for used cars is regarded as being "fair" in comparison with previous years at this time, but there are not enough used-car buyers in proportions to new-car buyers. Many dealers expect the used-car market to accelerate after the first of January.

Reports on *Automotive Industries* survey are expected to be completed by our Jan. 4 issue, and will be summarized therein.

Charles E. Best

Charles E. Best, official of the Ford Motor Company of Canada, Limited, in Vancouver, B. C., and former executive of the company in London, Ont.; Windsor, and Calgary, Alta., died in Vancouver at the age of 38.

Appointment of T. T. Johnson as sales metallurgist, Republic Steel Corp., pig iron division, has been announced by Earl C. Smith, chief metallurgist of Republic. Mr. Johnson will be attached to the Birmingham, Ala., district of Republic Steel.

CALENDAR OF COMING EVENTS

SHOWS

- National Motor Boat Show, New York, Jan. 17-25, 1936
- Amsterdam, Netherlands, Automobile ShowJan. 31-Feb. 9

CONVENTIONS AND MEETINGS

- National Aeronautic Association, Annual Convention, Washington, D. C., Jan. 6-7
- S.A.E. Annual Meeting, Detroit..Jan. 13-17
- American Roadbuilders Assoc., ClevelandJan. 20-24
- Assn. Highway Officials of No. Atlantic States, Atlantic CityFeb. 12-14
- American Society for Testing Materials, Regional Meeting, Pittsburgh, March 4
- U. S. Chamber of Commerce, Annual Meeting, WashingtonApril 27-30

The Horizons of Business

Tarnish on the Silver Question

SILVER is again playing a spectacular role on the stage of international finance and acting the part of a bad boy in disturbing the even tenor of Uncle Sam's conduct. To the layman it is all a deep mystery. The headlines tell him that the price of silver is dropping like a plummet, that Mr. Morgenthau is in some way to blame for this, that a deep-seated plot of Chinese and English financiers has been checkmated, etc. We have here all the elements of heavy drama with an Oriental villain, a British schemer and a sweet-faced male ingenué who is trying to achieve the more abundant life against distressing odds. Let us have the essential facts and the background.

Price Planning

One of the major objectives of the New Deal was to raise the price level. It was hoped that the Government might, through deliberate action, reverse the vicious downward spiral of declining prices and shrinking business and thus start the country back on the road to recovery. To this end the plans of Doctor Warren were given a generous trial. The gold content of the dollar was reduced by raising the price of gold from \$23.22 an ounce to \$35. It was no part of this strategy to do anything about silver.

Silver Champions

Congress, however, had a substantial bloc which did not propose to stand by mutely while the precious white metal was ignored in the mon-

etary counsels of the realm. The silver group had a twofold interest. One was defended by men who had inherited the faith of the great commoner, William Jennings Bryan, and believed that our economic ills were traceable to the abandonment of silver as an alternative basis for our money. (Prior to the passage of the Act of 1873 the dollar, by statute, was 23.22 grains of pure gold or 371.25 grains of pure silver.) These people felt that no planned price correction could be effective unless silver were restored to its ancient prerogatives. We may label this group—the inflationists.

The second interest was represented by men who came from silver-producing communities. They believed that silver had suffered since the "Crime of '73" from deliberate Government policy, that silver producers had the same title to property and the same right to a livelihood as any other group, and that any impairment of such title and right was an injury by the State which demanded reparation. In and out of Congress the silver interests have waged an unceasing struggle for the amelioration of their condition and in this they have been strikingly successful.

The Silver Purchase Act

The alliance of the silver interests and the inflationists in Congress at a time when the general agitation for price recovery was strong resulted in the passage of the Silver Purchase Act in the late spring of 1934. This act instructed the Gov-

ernment to purchase silver until the stocks of the white metal amounted to one-third the stocks of gold or until the price of silver reached \$1.29 an ounce. With the passage of the act the Treasury proceeded in good faith to carry out the provisions of the law.

On June 19, 1934, gold stocks in this country aggregated \$7,834 million. Silver bullion and silver coin together amounted to 693 million ounces. For purposes of the act this was valued at \$1.29 an ounce so that our silver on hand was equal, roughly, to 14 per cent of the gold and left the Treasury a long way to go to meet the requirements of the act. In fact the Treasury was obliged to purchase an additional 1,326 million ounces of silver in order to raise the value of its silver stocks to 33 1/3 per cent of the gold on hand. This was equivalent to approximately 25 years of normal American and about six years of normal world production.

The Quest for Silver

East and West, North and South Uncle Sam proceeded to buy silver. The price leaped upward. On May 4,

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

General business activity continued to increase last week, despite disturbing factors such as the demoralization in the silver market and the European political crisis. Retail sales were reported to be greater than in any similar period since 1930. Christmas buying remained active and was reported to be from 10 to 20 per cent above that in the corresponding period last year. Wholesale trade showed a gain of from 8 to 16 per cent.

Freight Loading Drops

Railway freight loadings during the week ended Dec. 14 totaled 615,237 cars, which marks a decrease of 21,896 cars below those in the preceding week, a gain of 35,035 cars above those a year ago, and a rise of 55,818 cars above those two years ago.

Retail Sales Gain

Sales of twenty-four store chains, includ-

By Joseph Stagg Lawrence

1935, it touched a high point of 81 cents an ounce. By Dec. 6, 1935, silver stocks on hand had been raised from 693 million ounces to 1447 million ounces, an increase of 109 per cent. On looking at his silver accounts and the task which still remained under the provisions of the silver act the Secretary of the Treasury must have felt a good deal like the squirrel in a wheel cage. Although he had raised his silver stocks 109 per cent his requirements under the law for silver purchase had been reduced only 5.5 per cent. On Dec. 6 he had 1253 million ounces to acquire as compared with 1326 million ounces on June 19, 1934.

The answer is that our gold stocks in the interval had increased from \$7,834 million to \$10,080 million and had raised the total silver required from 2019 million ounces to 2600 million.

Chinese Guinea Pigs

In the meantime what happened to China? It may be recalled, according to the exalted authority of the Congressional Record, that one of our principal motives in pushing the purchase of silver was to re-

store prosperity in China and increase the ability of Far Cathay to buy American wheat and cotton. This would increase the buying power of the American farmer and prosperity would become just as certain as death and taxes.

The Chinese were on a silver standard, that is to say, their monetary units were defined as so many grains of silver. Now if the value of silver goes up the value of the money which is defined in silver must likewise go up in exactly the same proportion. In other words a Shanghai dollar is worth twice as much when silver is 80 cents an ounce as it is when silver is worth 40 cents an ounce. When the value of money goes up its buying power increases and mathematically this can be accomplished only if prices decline in inverse proportion to the rise in the value of the money. Thus if the value of Chinese money is doubled it follows that Chinese prices must be cut in half.

There are two words for that and we do not have to go back to the Greeks for them. One is deflation and the other is depression and that is precisely what the Chinese are

experiencing as a result of our altruism.

Flight From Silver

To have the value of its currency doubled because some other nation felt this would redound to China's welfare proved embarrassing to Chinese statesmen particularly since the perception of the well-meaning alien philanthropist was 100 per cent in error. With some logic they decided to divorce Chinese currency from a metal which was at the mercy of such extraordinary international charity. As long as Uncle Sam was willing to pay a fat price for silver they (the Chinese) would sell their silver stocks and use the proceeds to establish a stabilization fund in London. This fund would then be used to stabilize Chinese currency in international exchange. Certainly not a criminal aspiration.

However when regarded through the red-yellow specs of American politics it seemed that the provisions of the Silver Purchase Act were operating to kill off the principal remaining monetary consumer of silver, to obtain for China funds derived from American taxpayers, and to enable England to attach another nation to that currency orbit described as sterlingaria. Politically that left a nasty taste. Hence American purchases of silver in London suddenly ceased and the price of silver dropped to the equivalent of 48 cents an ounce with the end not yet in sight.

From these simple facts any number of interesting conclusions may be drawn.

ing two mail order houses, during November were 13.8 per cent above those in the corresponding period last year. Sales of the two mail order houses alone showed a gain of 19.2 per cent.

Sales of those twenty-four companies during the first 11 months of this year were about 10.5 per cent above those in the corresponding period last year.

Power Production at New High

Production of electricity by the electric light and power industry during the week ended Dec. 14 registered another new high and was 12.2 per cent above that in the corresponding week last year. With the exception of the week ended Nov. 30, which contained the Thanksgiving holiday, the current figure marks the eighth successive week in which a new high record was made.

Lumber Shipments Less

Lumber shipments during the week ended Dec. 7 declined 8 per cent, and new business was 7 per cent lower. Production, however, increased 8 per cent.

Cotton Firm

Cotton consumed in the United States during November amounted to 567,385

bales, including linters, as compared with 619,293 bales in the preceding month and 531,116 bales in the corresponding month last year.

Petroleum Steady

Average daily crude oil production for the week ended Dec. 14 amounted to 2,869,050 barrels, as against 2,785,300 barrels for the preceding week and 2,418,850 barrels for a year ago.

Fisher's Index

Professor Fisher's index of wholesale commodity prices during the week ended Dec. 21 stood at 84.4, as against 84.0 the week before and 84.6 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended Dec. 18 showed an increase of \$1,000,000 in holdings of discounted bills.

Holdings of bills bought in the open market and government securities remained unchanged. Money in circulation increased \$61,000,000, and the monetary gold stock rose \$30,000,000.



DETAIL—This tail-light on new Hudsons shows when trunk cover is raised—warns oncoming cars for distance of several hundred feet

AS each weekend brings its appalling record of traffic accidents and fatalities, the problem of safety on the streets and highways becomes a topic of major importance everywhere.

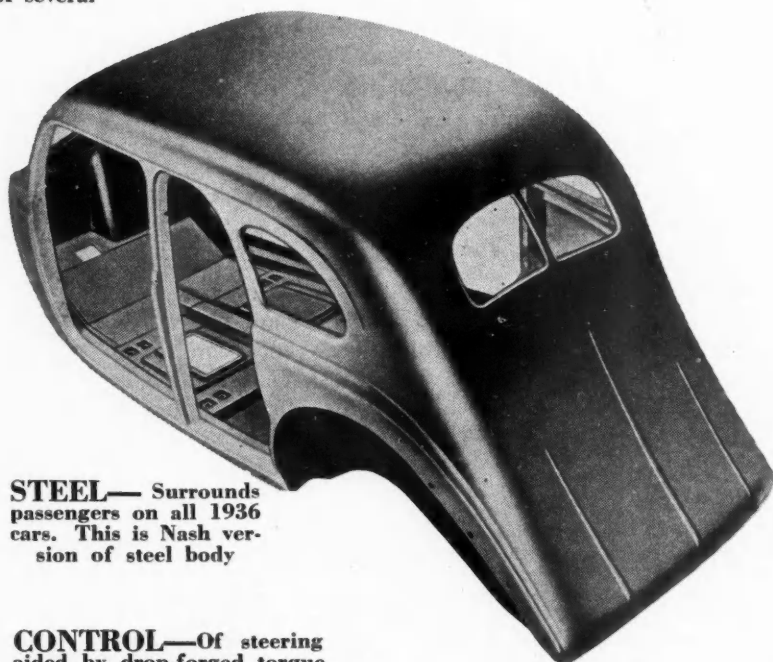
Unfortunately, its solution will not be found in the sporadic safety drives whose objective seems to be a matter of handing out a record number of traffic tickets, of which a goodly percentage represent minor violations having little bearing on safety. Nor do we get anywhere by harping on "too much speed" or "speed advertising" or the suggestions of the citizenry about muzzling the demon car with a speed governor.

Highway safety is a problem for the engineer and the psychologist. It has to do first with human beings—their behavior, and their fitness to drive an automobile; it has to do with the mechanical condition of the vehicle and the

Accents on Safety Cover Many Points

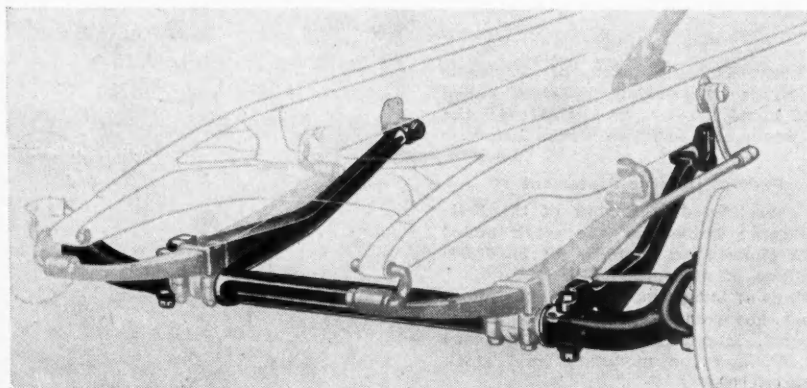
steps that are taken to assure its maintenance; it has to do with a scientific study of traffic conditions in each community and the establishment of sound and reasonable traffic rules; it has to do with a good highway design and upkeep; it has to do with good highway lighting as well as car illumination.

In recent years the automobile manufacturers have concentrated their efforts on safety features. At no time in the



STEEL—Surrounds passengers on all 1936 cars. This is Nash version of steel body

CONTROL—Of steering aided by drop-forged torque arms on Hudson and Terra-plane



history of the industry have we seen cars that are as safe mechanically as the product groomed for the 1936 market.

What are the things that spell safety on the new cars? Well, we find that every car in every price class has adequate anchoring facilities. Brakes are of generous size consistent with the weight of the car. Brake drums are made of materials that offer the highest coefficient of friction and long life; brake linings are fabricated of improved materials that stand up and hold under adverse operating conditions for a longer time. Where the car is so large

in 1936 Automobiles

Some of them, like the overcoat in the expense account, don't show—but help drivers over rough spots. Here are a few right out of the car descriptions

By JOSEPH GESCHELIN

as to tax the anchoring facilities, some source of power or servo-mechanism is supplied to relieve the operator of the heavy work. Wherever needed, the brake drums are ventilated in some suitable fashion to aid in cooling and thus make brake action more effective at high speeds.

All-steel bodies with steel roof and safety glass all-around are almost universally used. This construction offers unusual protection to the occupants in serious accidents.

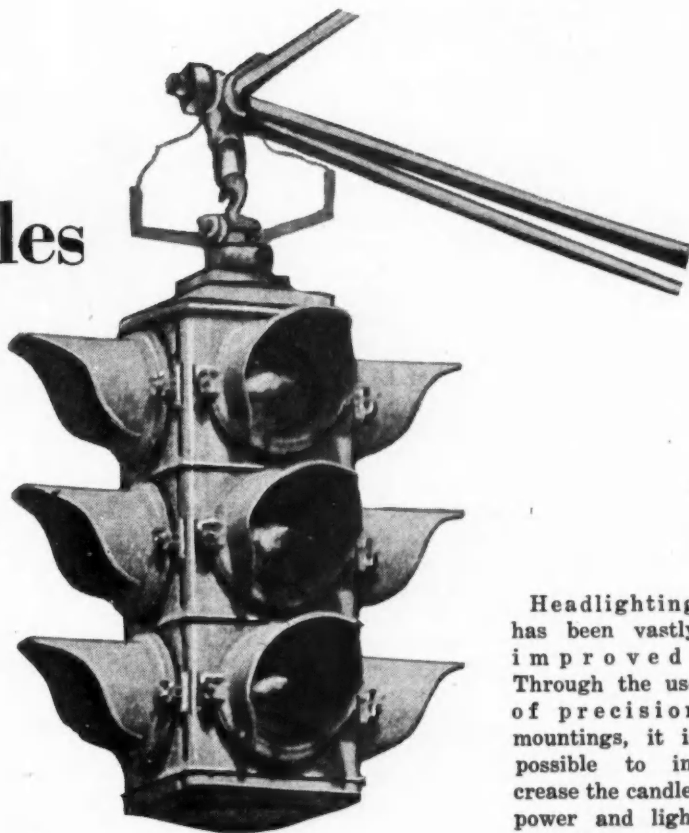
Improved steering makes it easier to hold the car on the road and eliminates another common element of fatigue.

Knee-action, improved springing in all its ramifications, improved upholstery—all contribute to a better ride and elimination of fatigue. And these are the things that produce better control of the car on any kind of road.

And still greater safety is afforded by the use of crossed beams, tilt rays, and mechanical depressed beam arrangements. Headlighting is now so designed that the safe distance ahead is clearly defined even at high speeds for night driving.

When you combine sturdier sound-proofed bodies and frames, with improved steering, braking, lighting, and ride control, you have developed the elements that contribute to driving without fatigue for the normal individual. When you add to this the ability to overtake moving vehicles with ease because of high-powered engines with fast top speed acceleration, you have the requisites for safety on the highway.

Softer balloon tires providing relatively large areas of contact with the road surface also contribute to safety by increasing traction and reducing tendency to skid. This is aided by the



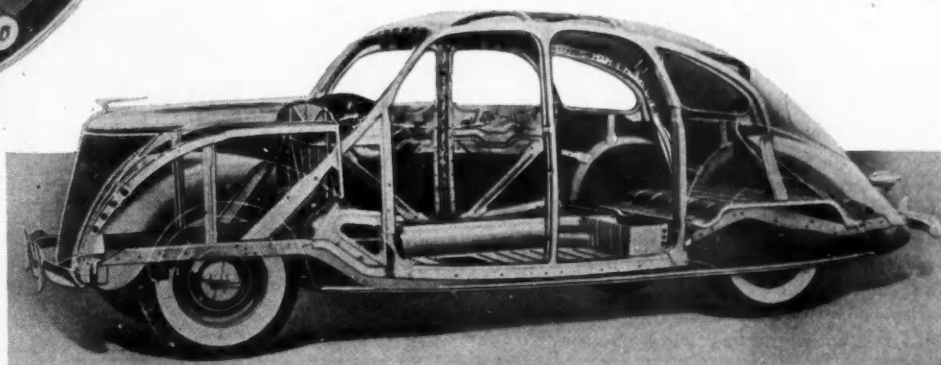
Headlighting has been vastly improved. Through the use of precision mountings, it is possible to increase the candle-power and light intensity without danger of glare.



DRUMS—Are more generous on many cars—for these on Nash extra safety claimed

FRAME—Absent on Lincoln-Zephyr—but new strength found in box-truss body

Automotive Industries

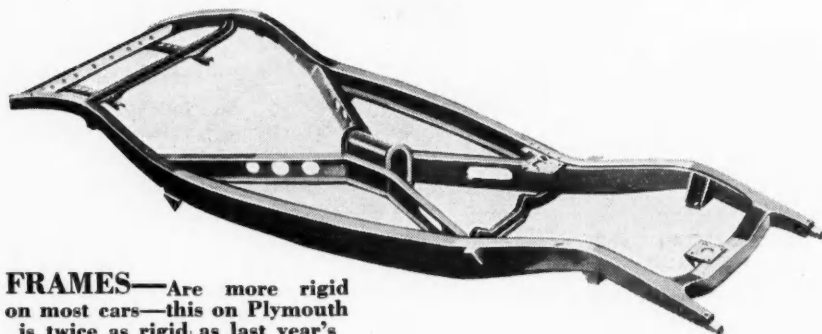


December 28, 1935

lower center of gravity of present-day cars, as well as by the growing use of wider tread.

While the automobile manufacturer has bent his efforts on the development of safe cars, we are faced with the practical problem of the cars now in service. Some of the older cars—those that are seven years old or older—are in many cases sufficiently obsolete to be totally unfit for service in this day and age. Other cars, even of recent vintage, are in questionable condition mechanically and constitute a menace on the streets. Something should be done to assure good mechanical condition, and it should be practicable to devise a system of controlled inspection in every community for this purpose.

It is obvious that even in the hands of a good driver a poor car is a menace not only to its occupants but to other cars. But the best car in perfect condition is a juggernaut in the hands of a driver who is not fitted at the moment, or perhaps at any time, to drive a car.



FRAMES—Are more rigid on most cars—this on Plymouth is twice as rigid as last year's

Why raise a hullabaloo about traffic accidents in communities where a person can get a license without even demonstrating his ability to handle a vehicle in traffic? One of the most elementary considerations in an enlightened community should be that of rigid driving tests before a person is given the right to drive a car. It may be desirable to apply certain psychological tests to determine the driver's reaction time—to note the speed with which he can act in an emergency.

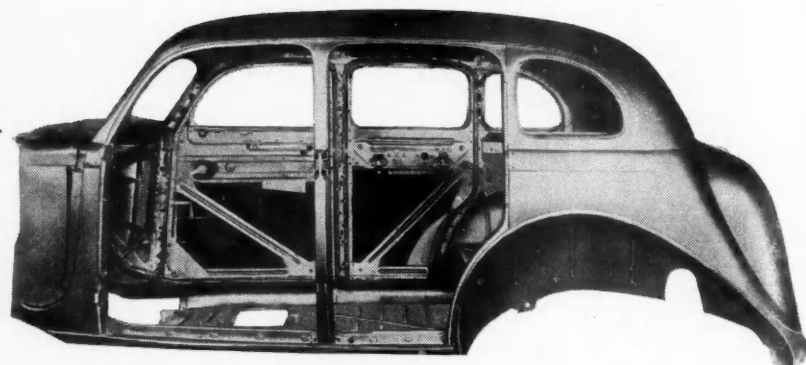
Instead of sporadic drives that hit the newspaper headlines, we should institute a widely publicized and continuous program of public education on matters of traffic safety. This should apply not only to the drivers but to pedestrians as well. Sane traffic rules, well-defined traffic rules, and the abolition of obnoxious "traps" would all contribute to safe driving.

When we leave the city we find that in too many places the automobile has outstripped highway design. And to make matters worse, the condition of obsolete highways is so poor as to constitute a decided menace.

We need highways wide enough to

carry the astounding volume of automobile traffic that threads the length and breadth of this country. Such highways should be adequately banked to permit safe driving within legal limits. Provision should be made to straighten out the turns and relieve the right-of-way so as to give clear vision ahead.

Not the least of the problems of highway officials is the matter of providing the right kind of road surface for new roads. Take an object lesson from the classic work of Professor Moyer of Iowa State College, who investigated the causes of skidding on wet surfaces. He has found some amazing facts concerning the coefficient of friction of certain



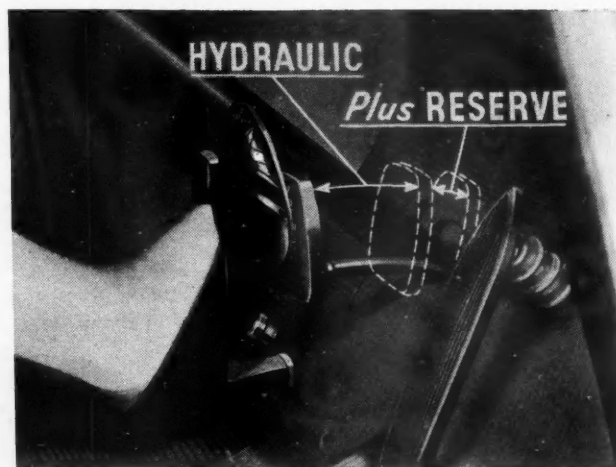
BODIES—Are boxes of trussed steel on Chrysler six and De Luxe Eight for 1936

road surfaces that have been considered ideal. Read his report, "Skidding Characteristics of Road Surfaces," in which he has given the data on 25 types of road surfaces. You will find that the proper selection of the road surface has a vital bearing on the highway safety from a purely mechanical viewpoint.

What is speed? When are you going too fast? It's really a matter of relative values. There are times on the open highway when 65 to 80 miles per hour is absolutely safe; there are city streets where 20 miles per hour may be reckless driving, and there are city boulevards everywhere where 30 miles per hour is perfectly safe and sane. And we all know that the 20-mile-an-hour driver on a broad highway is the biggest menace of all.

At the root of the whole problem is the matter of traffic education—the matter of making people conscious of the need for careful driving under all conditions. Alertness, driving skill, and common sense—these are the only ingredients that are needed. It is on these details that the psychologist and the educator must place the emphasis. Traffic regulations, stop streets, one-way traffic, etc., are matters for the trained engineer.

HYDRAULIC
Brakes are found on more cars—this linkage adds to safety automatically



JUST AMONG OURSELVES

Who's Responsible For Safety on Roads?

THERE was once a gentleman named Fletcher who made the startling discovery that most people ate too fast, and that the general welfare would be promoted if everyone would masticate custard pies, for example, more thoroughly before swallowing. Adherents to this principle sprang up throughout the land, but nowhere, so far as we know, was it stated that it devolved upon the suppliers of custard pies to see that every purchaser of their wares chewed every mouthful twenty times so that he would not be hag-ridden in the night by the terrors of acute indigestion.

Yet the light of such reasoning shone through a speech by the Hon. Daniel C. Roper last week, when he opened the Accident Prevention Conference in Washington on the eighteenth. Reviewing briefly the tremendous upturn in accidents involving motor vehicles, and the growth of public consciousness of them, the Secretary said pointedly: "The outstanding reasons for these motor fatalities are being demanded"—what is the cause of highway accidents?

"The group with the largest responsibility in this situation is the automotive industry." This startling statement was made by Mr. Roper as a preliminary to a series of questions, ascribed by him to correspondents who had written him concerning the need for the Accident Prevention Conference.

It is the position of this publication that the largest responsibility for accident prevention on the highways does *not* rest

with the manufacturers of vehicles and the parts which go into them, or the fuels which propel them.

Such responsibility as accrues to the manufacturer is in the direction of cooperating wholeheartedly with safety efforts, and incorporating in their products all the safety factors *that the public will pay for*. In both of these directions, they have shown in many ways their willingness and ability to function.

Mechanical Defects A Small Factor

MECHANICAL defects in automobiles are a small part of the direct cause of accidents on the highways, and are seldom the result of defects in design chargeable to the factories. Generally speaking, we believe that the motor vehicles which come from the factories are soundly engineered from the point-of-view of safety.

If the 15 per cent or so of highway accidents traceable to mechanical defects could be almost eliminated by increasing the price of all cars 10 per cent, do you suppose the public would be willing to pay the extra cost for the protection of the other fellow?

Such things must be considered in placing the responsibility for safety on the highway.

Perhaps Mr. Roper would like the industry to manufacture cars and instead of selling them outright to the consumer, license them for use under certain conditions, license to be revoked for abuse of the mechanism, etc. It seems to us that such a method would be the only one under

which the industry could be construed as having a direct responsibility for the product.

At no time in its history has the automotive industry been doing more to promote the cause of safety on the highway. This applies to individual companies, as well as efforts financed through the trade associations.

Leading Questions Seem Unfair

IT is unfortunate, therefore, that questions such as those which appear below should have been given wide currency through the Secretary's speech. Culled from Mr. Roper's mail, the following specious questions were presented at the conference for the automotive industry to answer.

Why is it necessary to manufacture cars with speeds of from 80 to 100 miles an hour?

What steps are being taken by dealers to insure the public against high-speed cars being sold to reckless, disabled or incompetent drivers?

Have certain manufacturers, especially in the light car field, effected economies, particularly in bumpers, so as to make cars less safe?

Why, with all the engineering skill that the industry possesses, has no greater progress been made in taking the dangerous glare out of headlights?

What definite steps does the industry plan to take to help eliminate old and unsafe cars from the road?

What is it going to do on its own initiative—and not through outside groups—to bring about uniform traffic legislation and law enforcement?

There is noticeable an unfortunate tendency to word the questions in what a lawyer would call a leading fashion. The one about bumpers seems just silly.

Tractor Industry CLIMBS

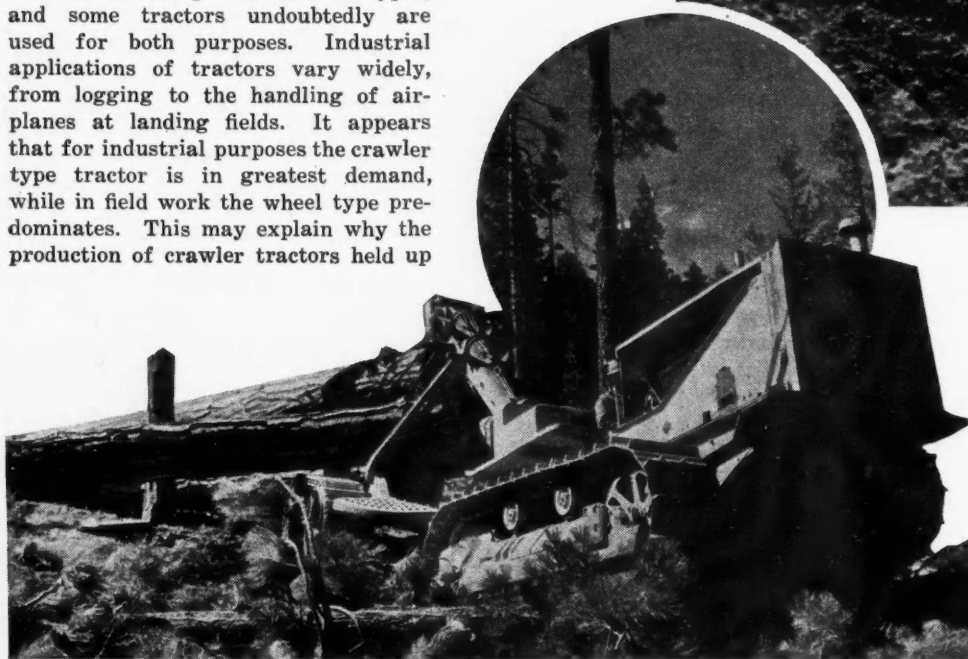
Varied types of farm work handled by air-tired, all-purpose tractors; Diesel engines reduce fuel costs.

By P. M. HELDT¹

TRACTORS are often divided into two classes—agricultural and industrial. There is little difference in the design of the two types, and some tractors undoubtedly are used for both purposes. Industrial applications of tractors vary widely, from logging to the handling of airplanes at landing fields. It appears that for industrial purposes the crawler type tractor is in greatest demand, while in field work the wheel type predominates. This may explain why the production of crawler tractors held up



Cleveland Tractor Co.



Caterpillar Tractor Co.

relatively well during the depression years. Much road building was done, at least during the earlier years of this period, and a number of large construction jobs were under way.

Like the design of airplanes, the design of farm tractors was greatly advanced by the world war. Motor tractors had been in use to a limited extent for about a decade previous to

¹Contributor of the articles on tractors in the 12th, 13th and 14th editions of the Encyclopedia Britannica.

the war, but with one or two exceptions they were of large size, suited only to the large farms of the wheat-raising states, where plowing, harrowing, drilling and reaping are the principal field operations, all of which could be performed with these tractors. Most of these tractors naturally were of quite crude design, owing to the newness of the industry, and were very heavy in proportion to the tractive effort which they were capable of developing. Then,

during the war, the prices of agricultural products rose to unprecedented heights and farm labor was hard to get, with the result that farmers in large numbers turned to the tractor. During the five-year period 1915-1919 tractor design and production probably advanced as much as it would have in two decades under normal conditions.

One of the objections to the earlier types of farm tractor was that they were not sufficiently adaptable. Most of them were designed mainly for plow-

unsuited to the cultivation of row crops. These latter are the principal crops throughout the agricultural Middle West, where the limitations of the conventional tractor were consequently keenly felt. As long as the tractor could not be applied to all of the operations for which horses are usually

(Turn to page 854, please)

S Toward Renewed Prosperity



As public works buying slackens, returning farm prosperity lifts production of adaptable new models.

By A. F. WADDEL

tors in farm use during the past ten years.

The tractor industry is now overcoming its second severe depression. The first came in 1921, when the war boom in farm products collapsed. War prices of the previous five years had proved an extraordinary stimulus to the growth of the industry. Tractor production doubled from 1916 to 1917; the next year it jumped from 60,000 to 130,000; and in 1920 almost 200,000 were built—a figure that was not again reached until seven years later.

To care for the war-time demand, factories all over the country were rushed into tractor production. In 1921 their number reached 187. With the collapse of their market, weaker plants went out of business or turned to other products. The number of tractor manufacturers dropped to about 60 in 1925, and since then has remained

HORSES are now selling at prices higher than at any time since the war boom, but farm horse-power is cheaper than it has ever been. A well-matched team of three-year-olds costs as much as \$600, while "all-purpose" tractors, rated at 18.8 h.p. can be bought at an average price of \$433.

The present demand for horses, however, has not been at the expense of the tractor industry. In 1920, there were 25,740,000 horses and mules on farms in the United States, and 245,000 tractors. By 1930, the horses and mules had dropped to 19,050,000, but tractors had risen to 920,000. This trend still continues, according to preliminary 1935 census figures. In the state of Iowa, one of the most typical farming communities, there are this year only 902-512 horses and colts, a drop from 1,040,079 in 1930.

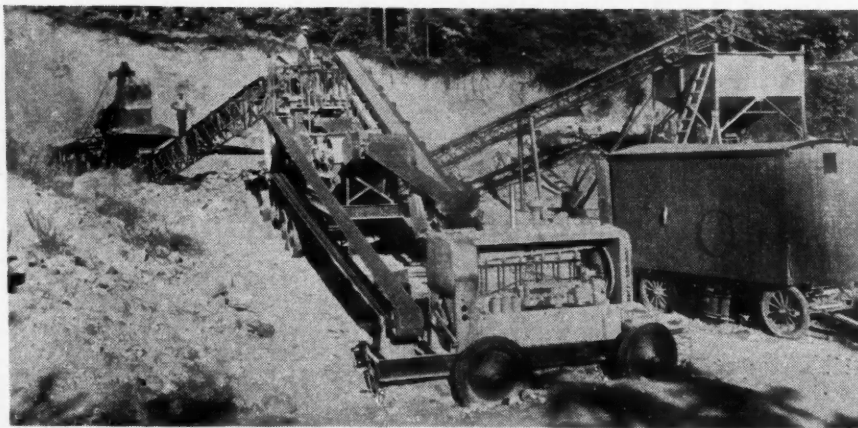
Tractor prices, meanwhile, have re-



Massey-Harris Co.

mained at their lowest, but unlike the horse, their number on farms has been increasing steadily. They passed the million mark in 1932, and since then have increased by more than 11 per cent. The accompanying table, based on estimates of the Farm Equipment Institute, shows the increase of trac-

While the farmer was slowly getting back on his feet during the 1920s, tractor makers were continually improving their products. The war demonstrated the advantages of the endless track, and a few years later track-laying machines were being produced for the farm. The power take-off was introduced, making the tractor's engine
(Turn to page 855, please)



CRUSH! Doing two jobs at once, a Caterpillar D-1100 Power Unit operates a rock crusher and screening plant.

Tractor Design Trends Toward All-Purpose Type

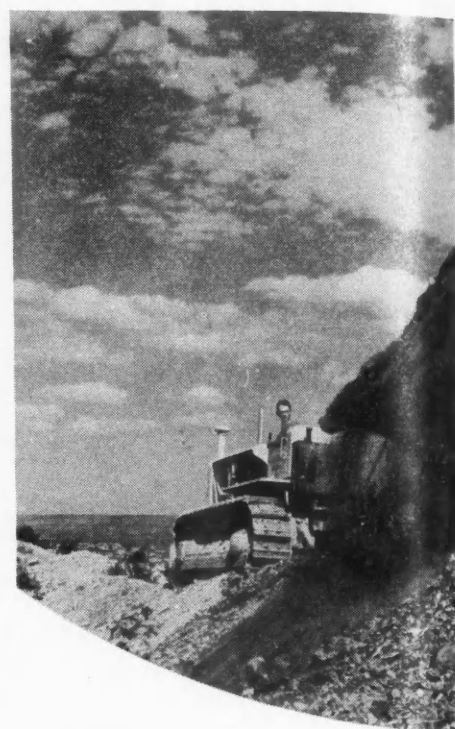
(Continued from page 852)

kept on the farm, the farmer could not dispense with an equivalent number of horses when buying a tractor. One or two horses generally were disposed of when a two- or three-plow tractor was bought, although as far as plowing capacity was concerned, the average tractor was the equivalent of six to ten horses.

The idea of the universal tractor (or all-work tractor) really dates back almost to the beginning of the industry, for during the latter part of the second decade of the present century, a two-wheeled, high-clearance tractor known

as the Universal was produced in considerable numbers in Rock Island, Ill. After a few years the manufacture of this machine was discontinued, probably for reasons which had nothing to do with the features of design which made it an "all-purpose" machine. It is not unlikely, however, that the commercial failure of this first all-purpose tractor delayed recognition by the industry of the fact that in the corn belt a tractor is of comparatively little use to a farmer unless it is adapted to both plowing and cultivating, besides belt work.

The recent vogue of the universal tractor apparently started with the introduction of the Farmall tractor by the International Harvester Company about 1930. The success of that model was such that it could not fail to impress other manufacturers, and today almost every



SPILL! Mountain tops are wagons so that coal

manufacturer is offering a model of the all-purpose type. International Harvester even has three Farmall tractor models at present.

The characteristic features of the all-purpose tractor are a high ground clearance, a single wheel or closely-spaced twin wheels at the front to run between rows in cultivating, and narrow-rimmed rear wheels adjustable on the axle shafts to permit of varying the tread in accordance with the spacing of the rows. The width of tread is generally varied in uniform steps. Rear wheels are now always provided with fenders, and when the

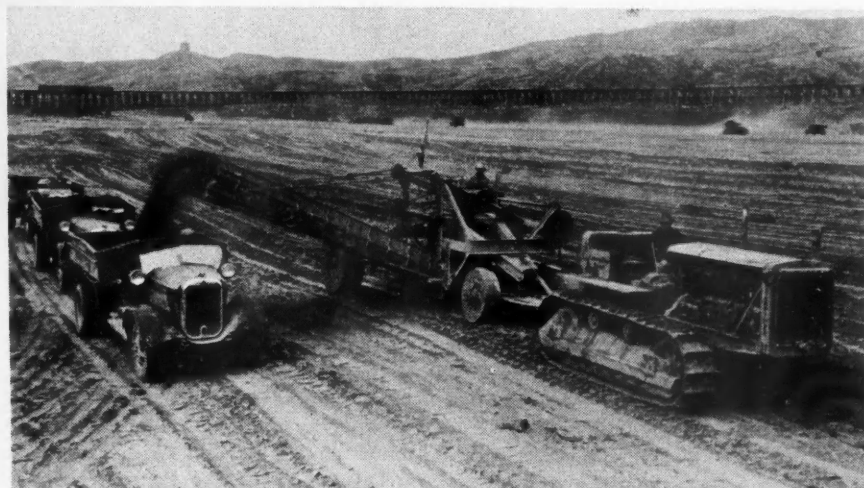
(Turn to page 856, please)



Allis-Chalmers Mfg. Co.

HAUL! Allis-Chalmers in big log operations.

Elevating grader moves earth at Ft. Peck Dam. **DIG!**



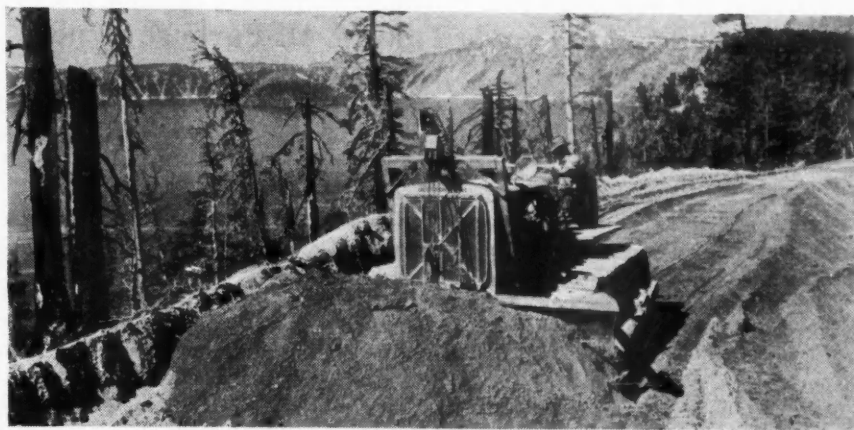
Caterpillar Tractor Co.
Photographs

lifted off in tractor-drawn crawler can be mined from the surface.

(Continued from page 853)
available for driving stationary farm machinery.

Tractor designers saw the need for another type of machine. This need was met with the all-purpose, or "row-crop" tractor, since it is built to provide adequate clearance for cultivating plants growing in rows. Most of the improvement of this type has taken place in recent years, following the blow which the more recent depression gave the tractor industry.

The value of all tractors produced in the United States in 1929 was \$196,000,000. This dropped to \$57,000,000 in 1931, and \$18,000,000 in 1933. From



PUSH! Dirt flies on the Rim Road when a tractor-driven bulldozer goes into action at scenic Crater Lake.

Low Point of Tractor Production Now Far Behind

1931 to 1933 the number of wheel-type farm, road and other tractors manufactured in the United States declined from 62,976 to 8,922; the number of wheel-type all-purpose tractors (included in the foregoing) decreased from 25,580 to 6,532; the number of crawler tractors from 7,264 to 6,013; and the number of garden tractors from 2,933 to 1,095. The figures of this year's industrial census will not be available for several months. Unofficial estimates, however, agree that the production will be well ahead of 1931.

The relatively better situation of the crawler type tractors during the depression was due to the vast public works program. Government agencies, federal, state and local, and contractors working on government projects, bought tractors to supply power for building roads, dams, bridges and power plants. This de-

pression-born market absorbed a large proportion of the bigger, higher-powered units. The Cleveland Tractor Co., for example, sold 39 per cent of its production to the government in 1933, 28.6 per cent in 1934, and this year, almost one-half of the first ten months' output was accounted for by government orders. Public works tractor buying is now tapering off, however, so that most of the future business of track-laying unit manufacturers must come from farmers and private industry.

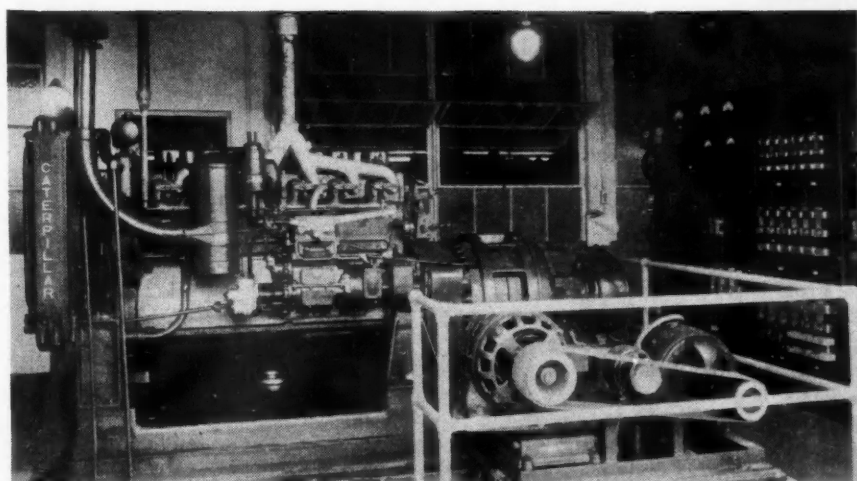
Several factors have been responsible for the return of prosperity to the
(Turn to page 857, please)



J. I. Case Co.

Case straddles rows of growing corn. **FARM!**

POWER! 102 h.p. Diesel drives dynamo.



Tractor Design Trends Toward All-Purpose Type

(Continued from page 854)

tread is adjustable, these are arranged to be moved in and out with the wheels. Of course, if the wheels are adjusted for maximum tread, which is generally around 80 in., they are at quite a distance from the power unit and seat, and there is then little need for fenders, so some designs are arranged so that the fenders can be removed under these conditions.

Another important feature of the tractor for row-crop work is good visibility from the driver's seat. This is necessary to enable the driver to steer the tractor accurately when cultivating small plants, so as to avoid injuring their roots or covering up the plants. To obtain good visibility the seat is usually placed fairly high and the sides of the tractor are kept free of anything that might obstruct the view.

Like most other power-operated farm implements, cultivators for use in connection with all-purpose tractors have had to be specially designed. It is usual to arrange the shovels in two sets, those stirring up the ground close to the rows or the plants being attached to a transverse draft beam secured to the forward part of the tractor frame, while the shovels which stir up the soil midway between rows are attached to a draft beam at the rear. This makes it possible for the operator to observe the action of the shovels close to the plants from his seat, and enables him to reduce injury to plants to a minimum. As a general thing, the course of the cultivator shovels is controlled by means of the tractor steering gear, but in at least one tractor a separate foot control for the shovels near the plants is provided.

In certain agricultural operations, such as cultivating and planting, turning at the ends of the field presents quite a problem. The implement must be raised out of the ground, then a short turn must be made, and the implement must be lowered again. With the older designs of tractors this was quite a tedious series of operations, which consumed considerable time. Most of the new all-work tractors have power lift for the implements. When coming to the end of the field, the operator steps on a button or sets a lever, and the implement is then raised by engine power through a power take-off. In some designs of wheel tractors, turning is facilitated by applying a brake to the inner wheel, at the same time setting the front wheel by means of the steering wheel. To ease the steering operation, antifricition

bearings are extensively used in the mounting of the pivot for these wheels and in the steering gear itself.

Another recent development in the farm tractor field is the application of low-pressure tires to the wheels of the tractor. Special tires for farm tractors were developed by Goodyear some years ago, and they are now listed in the catalogues of most manufacturers of wheeled tractors, which would indicate that they have found favor with farmers. There are certain obvious advantages connected with the use of pneumatic tires on tractors. A tractor so equipped is certainly much more comfortable for the driver.

C. R. Messinger



Chairman

—of the Board, Oliver Farm Equipment Co., Chicago, Ill.
—of the Executive Committee, Farm Equipment Institute.

It can be moved from field to field with much less trouble and at greater speed, and the cushioned support undoubtedly adds to the life of the tractor. For rear tires, inflation pressures as low as 10 lb. per sq. in. are used. The reason for this low pressure is undoubtedly that it will give enough ground contact area to enable the tractor to work on soft soil without sinking to great depths. The tires have a non-skid tread and give sufficient traction for all ordinary field operation without the use of anti-skid appliances. With steel wheels, on the contrary, it is absolutely necessary to use lugs when doing any kind of drawbar work,

and the removal of these lugs in preparation for a run over the road involves considerable labor. These tires go onto special drop center rims, which are combined with the tractor wheels into single units. Seats for the beads of the tire on the rim are inclined toward the outside, so that as the tire is inflated and the bead is forced outward by the air pressure, it seats firmly. It is claimed for the pneumatic tires that they make steering easier and that they reduce the power required for moving the tractor over the ground, so that in some cases a tractor which will pull two plows on steel tires will pull three on pneumatic tires, and that it will pull a certain number of bottoms in high gear with pneumatic tires where the intermediate gear would have to be used for the same number of bottoms with steel wheels.

During the past several years the Diesel engine has been successfully applied to tractor work. Most of the earlier tractors were designed to burn kerosene, but the use of this fuel did not prove entirely satisfactory, especially when the price of kerosene rose to near that of gasoline, and many farmers who bought kerosene-burning tractors later converted them to operation on gasoline. Tractor engines are still being designed to use low-volatility fuels, but distillate and furnace oil have taken the place of kerosene as low-priced tractor fuels. A large number of tractors with Diesel engines have been sold during the past three years, but just what proportion of them is in use on farms is not known. Nearly all of these Diesel engines are carried by crawler-type tractors, and the latter are being used predominantly for industrial services. The Diesel-powered tractor is considerably higher in first cost, listing at from 30 to 35 per cent more than the equivalent carburetor-engined tractor. The advantage of the Diesel lies in its saving on fuel cost, and this saving, of course, goes up in direct proportion to the number of hours use of the engine in the course of a year. The advantage of the Diesel therefore is most pronounced in services where it can be kept running practically throughout the year. The farm tractor, like most farm implements, is used only a small proportion of the working days of the year, for which reason the first cost is a more important, and the running expense a less important, item of the total cost figure, but the situation is changing in a way favorable to the Diesel by the introduction of all-work tractors. However, the engines required for "all-purpose" tractors are small and at present no Diesel engines of output suitable for

this work are being made in this country. Abroad a number of farm tractors with single-cylinder horizontal Diesel and hot bulb oil engines are being manufactured, but the American

farmer, who drives his six-cylinder or eight-cylinder car, probably would be rather unfavorably impressed by the lack of smoothness and flexibility of the single cylinder in a tractor engine.

Low Point of Tractor Production Now Far Behind

(Continued from page 855)

tractor industry. The continual improvement of the all-purpose tractor is broadening its market. It is estimated that one farmer in six now owns a tractor, but they are mostly cultivators of large acreages. There are in the

Tractors on Farms

Number of tractors on farms in the United States on Jan. 1 of each year, 1925 to 1935, and percentage of gain over next preceding date.

(Estimates of the Research Department, Farm Equipment Institute.)

Year	Number on Farms	Per Cent Gain
1925	505,933*	...
1926	584,332	15.5
1927	665,038	13.8
1928	766,332	15.2
1929	826,183	7.8
1930	920,032†	11.4
1931	997,943	8.5
1932	1,051,646	5.4
1933	1,077,121	2.4
1934	1,090,203	1.2
1935	1,123,251	3.0
1935	1,174,889‡	4.6

* U. S. Bur. of Census. † Census reported 920,021 for this date. ‡ As of July 1, 1935.

United States two million farms of 50 acres or less which until late years have had no tractor designed for their needs. Tractors are now being made for almost any sort of work the small farmer may wish to do. The problem of designing a machine for different widths of rows has been solved. Tools may be rapidly changed. One operator drives the tractor and from his seat operates the implement units, which are often power controlled. All work to be done is in full vision of the driver. Turning at row ends has been made easier. The tractor no longer proceeds at a horse's pace. The modern tractor's speed has not only made it possible for the farmer to do more work in a day, but at the same time has done away with the monotony of cultivating row crops.

The introduction of pneumatic tires has had a large share in making the all-purpose tractor more popular. They have made possible increased speeds, and have reduced vibration and shocks. The tractor can be moved quickly from one field to another, over paved roads as well as rough ground. With lug

type chains, the pneumatic-tired machine is said to be able to negotiate soils in which steel-lugged wheels mire down. Three years ago there were practically no low pressure tires in use on farm machines, while this year approximately \$20,000,000 worth will be sold. From 30,000 to 40,000 farm tractors sold this year will be equipped with tires, and it is estimated that 55,000 to 60,000 more will be changed over from steel wheels before the end of the year.

Use of the Diesel engine to furnish tractor power has been another depression outgrowth. Cheaper fuel cost has promoted greater sales of the more powerful types of machine when equipped with Diesels. The Caterpillar Tractor Co. announced its first Diesel model Aug. 31, 1931. It took a little more than two years for this firm to build its first thousand Diesel tractors. Since then, production of Diesels advanced rapidly, and on Nov. 13, 1935, Caterpillar Diesel No. 10,000 was produced. As many were built during the last 12 months as during the previous three years.

How rapidly the tractor industry was progressing technically during depression years is shown in the following table, compiled from census figures:

Tractor hp. and values in 1931 and 1933		Value	
Types of Tractor	Hp.	1931	1933
All wheel	26.5	23.6	\$683 \$563
Other than all-purpose	30.8	36.0	738 920
All-purpose	20.2	18.8	602 433
Crawler	40.5	39.5	1,830 2,070
Garden	2.5	3.16	211 174

The rapid evolution of the tractor

W. C. MacFarlane



President

—of the Minneapolis-Moline Power Implement Co., Minneapolis, Minn.
—of the Farm Equipment Institute.

during the past three years has created a new problem, that of standardization. Wheel equipment has been a haphazard development. Too many sets of tires may be required to equip the machines on a fair-sized farm. Interchangeability is desirable for certain parts and tools as well as tires.

As a result of the increased activity of the tractor industry, the Society of Automotive Engineers established last March a new professional activity, known as the Tractor and Industrial Power Equipment Activity. Tractor engineering had been represented in the Society from 1916 to 1929, when a vice-president representing tractor interests had a place on the S. A. E. Council. At the reorganization, in 1929, interest in tractor matters did not seem to justify the recognition of a professional activity, but more re-

(Turn to page 861, please)

Tractor Production by Units and Dollar Value, 1925 to 1933

	1933		1931		1929		1927		1925	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Wheeled Type.....	2,390	\$ 2,190,181	61,940	\$ 42,601,471	195,980	\$ 141,653,219	184,594	\$ 101,649,329	167,553	\$ 100,848,691
Except All Purpose.										
Belt Horsepower.										
Under 25.....	14		15,481	\$ 8,236,361	128,360	\$ 81,228,583	136,349	\$ 55,040,471	128,023	\$ 48,237,763
25-29.....			2,394	\$ 2,070,475			17,275	\$ 16,054,193	8,283	\$ 8,478,526
30-49.....			18,065	\$ 16,166,210	67,340	\$ 59,825,202	30,514	\$ 29,538,849	21,201	\$ 23,925,957
50 and Over.....	2,376		139	\$ 254,250	280	\$ 599,434	456	\$ 1,015,816	530	\$ 2,250,129
All Purpose.....	6,532	\$ 2,828,310	25,831	\$ 15,874,175						
Tracklaying Type.....	6,013	\$ 12,460,496	7,089	\$ 13,316,457	27,101	\$ 53,601,569	10,319	\$ 27,719,665	6,060	\$ 17,441,015

Measuring the Scavenging Efficiency

It is a well-recognized fact that the efficiency and power output of two-stroke Diesel engines depend to a great extent on the effectiveness of scavenging, or, more explicitly, on

- 1—the amount of fresh air contained in the cylinder charge;
- 2—the amount of combustion products of the preceding cycle remaining in the cylinder charge, and
- 3—the amount of scavenging air lost through the exhaust ports and the power absorbed in driving the blower.

It is generally possible to get a large amount of air into the cylinder charge and to have the charge relatively pure by using a large amount of scavenging air, of which a good deal will be lost through the exhaust ports. Conversely, the loss of scavenging air can be reduced by limiting the amount of such air supplied to the cylinder, but this will have an unfavorable effect on the mass and the purity of the cylinder charge. For an engine of given speed and dimensions it is possible, however, to so choose the (a) blower dimensions,

(b) proportion and arrangement of passages, valves, ports and pistons, and (c) pressures and temperatures of the cycle, that a full charge of high purity remains in the cylinder, with little loss of scavenging air and only moderate power consumption by the blower.

In recent years the problem of effective scavenging has received considerable attention; numerous novel proposals have been made, patents obtained, and engines designed and built in which, by virtue of specially shaped passages and other measures, high effectiveness of scavenging is attained (or claimed); several papers and reports have been published on various aspects of scavenging and on actual tests on engines. Often, however, in these publications the terms are insufficiently defined or ambiguously used, and there is discrepancy in their use by different authors. A clarification and strict definition of the concepts and terms used in connection with scavenging appears therefore timely and desirable, and it is attempted in this article.

At the Engineering Experiment Sta-

tion of The Pennsylvania State College, investigations have been carried on for several years on various Diesel-engine problems. Recently some tests were made on an experimental two-stroke engine, especially with respect to its scavenging characteristics, and these tests will be described.

The Scavenging Process

The sequence of events during the exhaust, scavenging and charging periods is diagrammatically represented in Fig. 1. To the engine of swept volume V_0 (which can be calculated from the engine dimensions) the blower during each cycle delivers a total fresh air charge of volume V_1 (which can be measured with calibrated orifices or nozzles, or with rotary or other types of meters). All volumes are considered as reduced to standard temperature and pressure, and refer to one cylinder and one cycle.

During the scavenging and charging periods this air charge enters the cylinder and intermingles with the spent gases remaining there from the preceding cycle; part of it escapes through the exhaust port or valve, and is lost so far as the combustion process is concerned.

Therefore, when the intake port closes a quantity of air $V_2 = V'_2 + V''_2$ remains in the cylinder, V'_2 being the volume of "new air" and V''_2 the volume of "old air" (spent gases) from the previous cycle.

The combined volume can be determined from the cylinder volume at the moment when the intake closes (from the engine dimensions), from the pressure existing at this moment (from an indicator diagram) and from the momentary temperature (which can be assumed, or approximately calculated from the temperature of the entering air and the increase in pressure). How the proportions of V'_2 and V''_2 can be determined will be explained later.

This quantity of air V_2 is compressed, takes part in the combustion and expands. During these periods, however, a small portion V'''_2 leaks from the cylinder, by the piston rings, into the crankcase. This quantity can be measured by any air-measuring method by closing up all except one of the openings of the crankcase, the one not closed being connected to the measuring device.

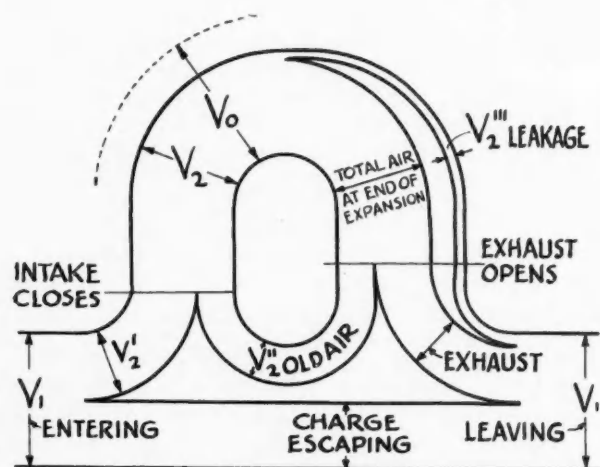


Fig. 1. Flow of Air through a Two-Stroke Engine

- V_0 = SWEEPED VOLUME
- V_2 = TOTAL AIR at beginning of compression (OLD & NEW)
- V_1 = TOTAL CHARGE
- V'_1 = NEW AIR

of Two-Stroke Diesel Engines

By K. J. DE JUHASZ
The Pennsylvania State College

During the exhaust and scavenging periods a part of the volume $V_2 - V''_2$ passes out through the exhaust, the remainder V''_2 remains in the cylinder, mixes with the entering new air V'_2 , and the above-described cycle of events is repeated.

Therefore, in any appraisal of scavenging and charging, the following quantities must be considered:

V_o = swept volume

V_1 = total volume of air charge delivered by blower

V_2 = total volume of air present in the cylinder at the beginning of compression:

$V_2 = V'_2 + V''_2$

V'_2 = new air

V''_2 = old air

V'''_2 = air leakage from cylinder during one cycle

Each volume refers to one cylinder and one cycle, and is reduced to standard pressure and temperature conditions.

These quantities can be combined into various figures of merit, of which the more important are the following:

$$\frac{V_2}{V_o} = \frac{\text{Old Air} + \text{New Air}}{\text{Swept Volume}} = \eta_v$$

This is the volumetric efficiency, which is a measure of the completeness with which the available engine volume is utilized. It depends mainly on the scavenging pressure and on the resistance and arrangement of the intake and exhaust passages.

$$\frac{V_1}{V_o} = \frac{\text{Blower Charge}}{\text{Swept Volume}}$$

This is the excess-air coefficient, which is a measure of the adequacy of the blower.

$$\frac{V'_2}{V_2} = \frac{\text{New Air}}{\text{New Air} + \text{Old Air}} = \eta_s$$

This is the scavenging efficiency, which is a measure of the completeness with which the gases of the preceding cycle are expelled and replaced by fresh air. It depends on the flow conditions in the cylinder during the exhaust and scavenging processes.

Measurement of Scavenging Efficiency

The above formula for scavenging effi-

ciency can be transformed into another form:

$$\frac{V'_2}{V_2} = \frac{V_2 - V''_2}{V_2} = 1 - \frac{V''_2}{V_2}$$

which latter formula contains the ratio "old air/total air," which is subject to experimental evaluation.

In an engine running under its own power, the scavenging efficiency can be determined by taking gas samples from the engine with the aid of a sampling

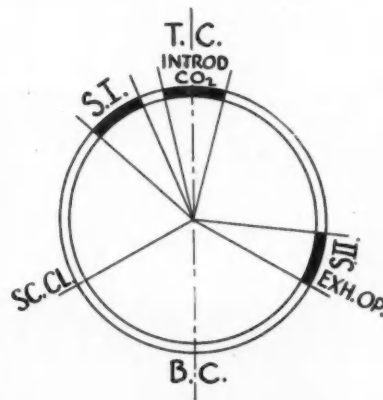


Fig. 2. Optimum condition for taking the samples and introducing the contaminating medium

valve, before combustion (Sample I) and after combustion (Sample II), and analyzing them for any combustion product, preferably CO_2 . Since there is no CO_2 in the scavenging air, the CO_2 content of Sample I is due to the remnant combustion products, i.e., to "old air." The ratio "old air/total air" is, therefore, equal to

$$\frac{\text{Per cent of } \text{CO}_2 \text{ in Sample I}}{\text{Per cent of } \text{CO}_2 \text{ in Sample II}}$$

In this procedure it is desirable to take Sample I just after the intake has closed and Sample II just before the exhaust opens.

If it is desired or necessary to determine the scavenging efficiency without running the engine under its own

power, by motoring it, then some contaminating gas must be artificially introduced. CO_2 can be used to advantage because of its harmlessness, its easy detectability with the Orsat apparatus, its ready availability in containers, and its cheapness. The introduction must be effected by means of a sampling valve, always under the same pressure and at the same phase of the engine cycle; i.e., against the same counter-pressure. Then, by taking samples of the charge in the cylinder with the aid of one or two sampling valves before and after the introduction, and measuring their respective CO_2 concentrations, the ratio of "old air/total air" can be determined.

This method is based on some assumptions that are not wholly correct, and it is subject to several sources of error, namely:

1. The scavenging process with a motored engine differs from that of an engine running under its own power, owing to the absence of combustion, with resulting higher temperatures and pressures. The scavenging efficiency in the engine under power is probably higher than that determined when motoring.

2. Introduction of the CO_2 , which occurs when the valves or ports are closed, has a supercharging effect and therefore alters the process. This influence is contrary to, and in part compensates for, the effect under 1. From this point of view, therefore, the introduction of a small amount of CO_2 is desirable. On the other hand, in order to reduce errors of the Orsat analysis, it is better to introduce a large amount of CO_2 . In an actual test, therefore, a compromise must be struck between these conflicting considerations.

3. It is tacitly assumed that at a given phase of the cycle the CO_2 concentration is the same throughout the engine cylinder. This is not strictly true, as differences exist between the CO_2 content in different regions of the cylinder. In order to minimize errors from this source, it is desirable to

- introduce the CO_2 through a type of nozzle which assures intimate mixing with the cylinder air;
- introduce the CO_2 under a fairly high pressure difference, in order to promote intensive turbulence;
- introduce the CO_2 at a point of the cycle close to dead center when the cylinder volume is small;

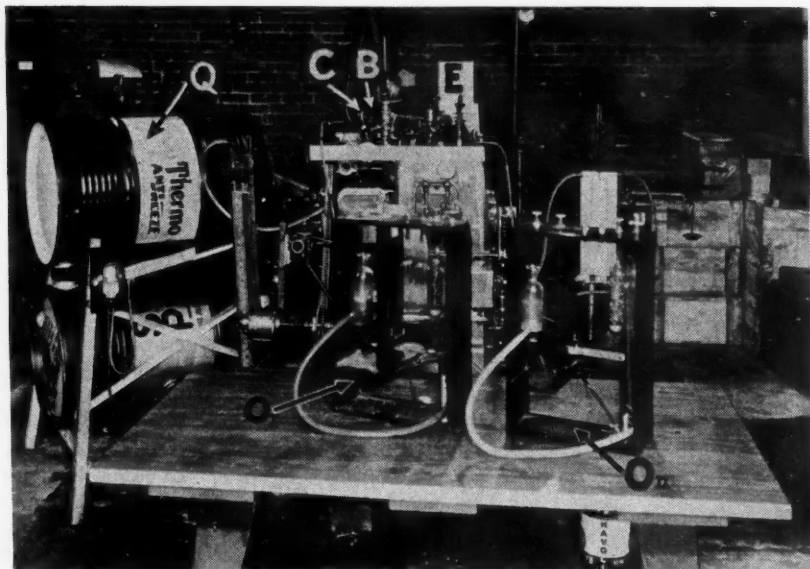


Fig. 3. Arrangement of test for scavenging efficiency (The Pennsylvania State College)

Q, quieting tanks for damping the fluctuations of exhaust, for measuring the total air passing through the engine; B, sampling valve for introducing CO₂; C, sampling valve for taking Sample I; E, sampling valve (modified cylinder relief valve) for taking Sample II; O₁ and O₂, Orsat apparatus for determining CO₂ concentration of samples.

d. take Sample I a long time after the charging port has closed and Sample II a long time after the introduction of CO₂ is ended.

This last requirement is met if the timing diagram shown in Fig. 2 is followed, which calls for the use of three sampling valves, for taking Sample I, for taking Sample II, and for introducing the CO₂ respectively.

4. Another source of error is the volume of the connecting passage between the cylinder and the sampling valve, in which a mixture of all of the phases is collected during the cycle. Therefore, it is desirable to make this connecting passage as short as possible. Valves which come flush with the wall of the compression space are preferable for this purpose. For the introduction of the CO₂ this consideration is not important. In order to minimize errors from this source, the duration of opening of the sampling valve should be long, allowing a volume many times greater than the connecting passage to pass through the valve every time it opens.

The experimental arrangement used at the Pennsylvania State College is shown in Figs. 3 and 4. Two DeJuhasz indicator sampling valves and the cylinder relief valve were available. The latter was so modified that its spring pressure could be reduced while the engine was running, so as to make it open under the influence of the compression pressure. It could then be used as a sampling valve for taking Sample

II, which must open in the vicinity of top center. Owing to this limitation the following timing was adopted for the

sampling valves of the test apparatus.

SAMPLE I was taken at 135 deg. B.T.C. through a DeJuhasz valve attached to the Bosch nozzle which in regular operation of the engine served for fuel injection. By increasing or decreasing the tension of the valve spring, the needle valve could be closed or opened, thereby establishing or shutting off communication with the sampling valve.

INTRODUCTION of CO₂ was effected at 90 deg. B.T.C. through another DeJuhasz valve attached to a pipe leading into the combustion chamber. The CO₂ bottle was connected to the sampling valve by means of a long copper tube of about 3/16-in. diameter, coiled up, which acted as a reservoir of reduced pressure (500 lb. per sq. in.) and as a heat absorber from the atmosphere, preventing freezing of the CO₂ and consequent clogging of the sampling valve.

SAMPLE II was taken at top center, when the cylinder pressure was near its maximum value, through the modified cylinder relief valve.

In this manner consistent results were obtained, showing the variation of scavenging efficiency with speed and scavenging air pressure. These test results were found valuable in eliminating defects and suggesting means for improving engine performance.

Some possible modifications of the above-described method may be of interest. These tests can be performed

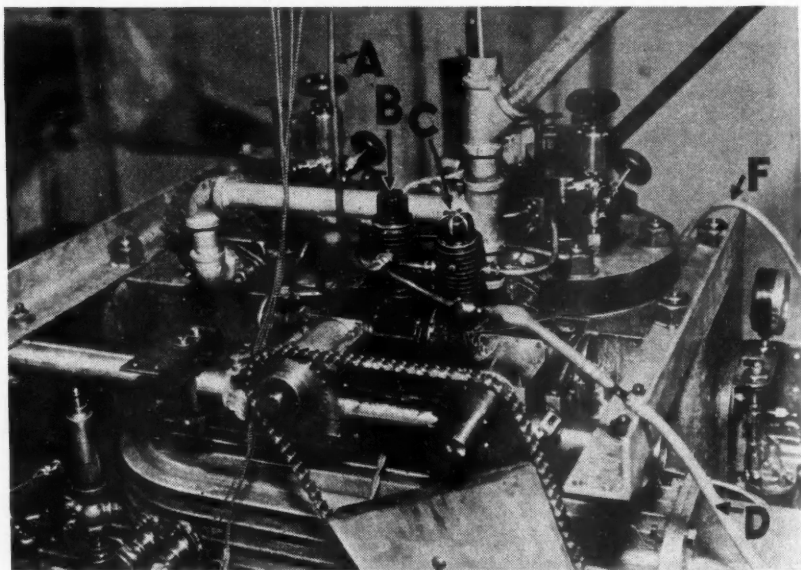


Fig. 4. Arrangement of test for scavenging efficiency (The Pennsylvania State College)

A, tube from CO₂ container; B, sampling valve for introducing CO₂; C, sampling valve for Sample I; D, pipe conducting sample I to Orsat apparatus; (E, the cylinder relief valve which serves as a sample valve for Sample II is not visible in this picture.) F, pipe conducting Sample II to Orsat apparatus.

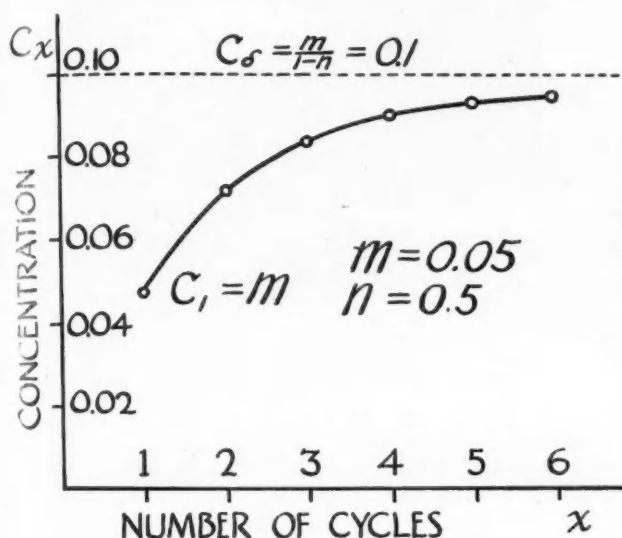


Fig. 5. Growth of concentration with repeated equal contamination, as a function of the number of the cycle. (For $m = 0.05$ and $n = 0.5$)

also with two sampling valves; this, however, involves a longer delay between taking the samples, which is somewhat of a disadvantage from the viewpoints of rapidity of the tests and their accuracy. Two possibilities present themselves:

(1) The CO_2 may be introduced in the vicinity of the T.C. through one sampling valve. Both samples are taken with the other sampling valve, one before, the other after the introduction of CO_2 .

(2) Samples are taken with one sampling valve set to open in the vicinity of T.C. An automatic, spring-loaded valve can be used for this purpose. The CO_2 is introduced with the other sampling valve, which is set to

open first before and then after top center, care being taken that the cylinder pressure is approximately the same in both phases of introduction.

There is another possibility of determining the scavenging efficiency, with only one sampling valve and an automatic relief valve, which method, however, involves some additional measurements. Let us suppose that during each successive cycle there is being fed to the engine, through a sampling valve, a certain amount of CO_2 equal to m times the total amount of air in the cylinder, m being a fraction and small enough so that the supercharging effect of the introduction of the CO_2 is negligible. The percentage of "old air" remaining in the cylinder from the pre-

vious cycle is n (n being equal to $1 - \eta_s$).

Then the CO_2 concentration in successive cycles, as shown by samples taken through the automatic relief valve, will be as follows:

Number of cycle	Proportion of CO_2 (C_x)	Proportion of Air ($1 - C_x$)
0	0	1
1	m	$1 - m$
2	$mn + m$	$1 - (1 + n)m$
3	$m(1 + n + n^2)$	
x	$m(1 + n + n^2 + \dots + n^{x-1})$	
	$= m \frac{1 - n^x}{1 - n}$	

The increase in concentration with the number of the cycle is shown in Fig. 5.

If, now, we can select samples from two definite cycles of the series, say cycle No. x and cycle No. y , and analyze for their respective CO_2 concentrations, then we get two equations from which n and m can be determined. The matter can be further simplified if we make $x = 1$, that is, if in some way we measure the amount of CO_2 introduced during each cycle; and $y = \infty$, that is, if we take one sample from the cylinder a long time after the introduction of CO_2 has begun and equilibrium therefore has become established. The concentrations then will be:

$$C_1 = m \frac{1 - n}{1 - n} = m,$$

$$C_\infty = \frac{m}{1 - n},$$

whence

$$\frac{C_1}{C_\infty} = 1 - n = \eta_s,$$

so that the scavenging efficiency is obtained directly.

Low Point of Tractor Production Now Far Behind

(Continued from page 857)

cently tractor engineers made themselves felt to such a degree that their group was again given a place among the outstanding activities.

Belt driven machines have been designed to take advantage of the tractor's mobile power. Threshing, corn shelling, hay baling, feed grinding, silo filling, and other sorts of farm chores are now handled by machines driven by the tractor's belt.

"Power is the essential requirement of the farmer," says the Farm Equipment Institute. "Without power to operate it, no machine is worth anything. It is not practical to build a central plant to supply power to a

group of farms, but each must have its own power. With animal power strictly limited, and with mechanical power more efficient, economical and satisfactory, it seems inevitable that there will be a continued and lasting

upward trend in the number of tractors on farms."

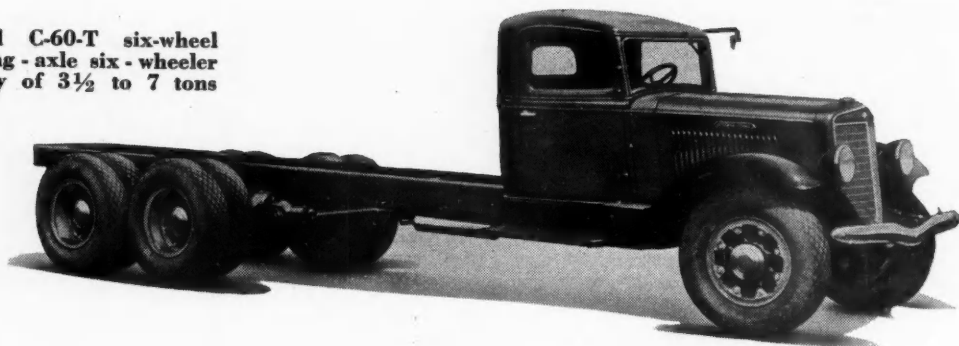
Detail mechanical description of the new products in the tractor field will appear in subsequent issues of AUTOMOTIVE INDUSTRIES.

Klingler Supervises First Pontiac Foundry Pouring

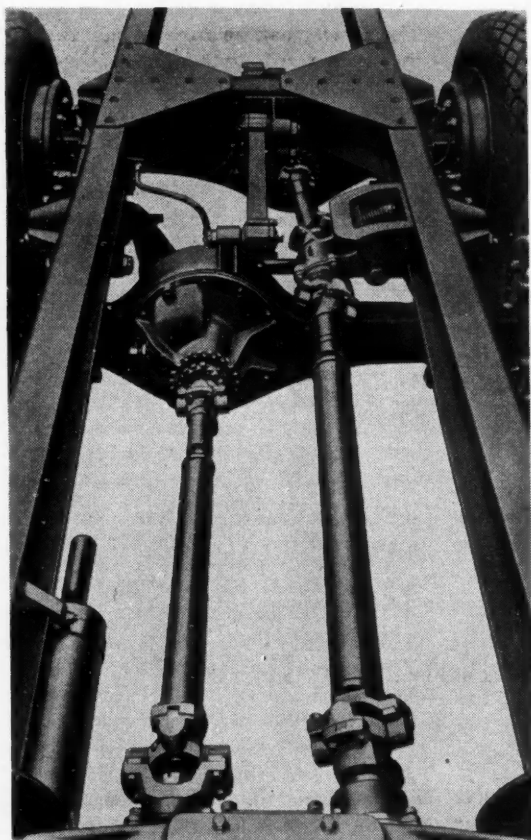
After being idle since the spring of 1932, operations were resumed at the foundry of Pontiac Motor Co. the week of December 16. One of the four cupolas and the first of the seven production lines went into operation, with Harry Klingler, president, supervising the first

pouring. The foundry has capacity for 400 tons in a nine-hour day and is expected to be operating at 20 per cent of capacity by the end of this month and to reach full capacity by spring. Working force, now numbering 150 employees, will be augmented to 800.

International Model C-60-T six-wheel chassis. This trailing-axle six-wheeler has a rated capacity of $3\frac{1}{2}$ to 7 tons



International Uses Two-Speed Axle on



INTERNATIONAL HARVESTER COMPANY has announced the addition of three new models to its line of motor trucks, each of which features a two-speed axle which, in conjunction with the four-speed transmission, gives the trucks eight forward speeds and two reverse. The new models are the CS-30, CS-35 and CS-35-T. With the low gear ratio the truck is able to carry a heavy load up hill or over rough roads, while the high-gear ratio permits of high speeds on level

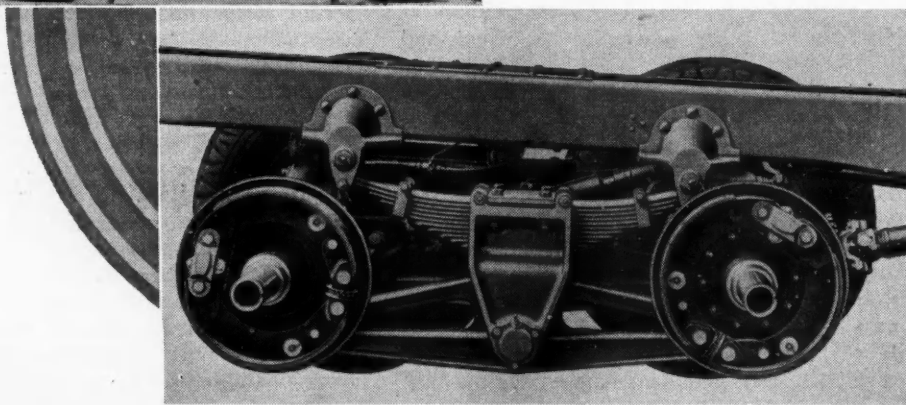
In the dual-drive six-wheel models the power is delivered to each rear axle individually by means of a power divider

roads with light loads. A simple movement of the shifting lever effects the change from one ratio to the other, and the change is made while the truck is in motion. Two combinations of ratios are available, viz., 5.14-7.15 and 6.16-8.57. It will be seen from these figures that the reduction gear in the rear axle gives a reduction ratio of 1.39 to 1.

The Model CS-30 is available in two wheelbases, 133 and 157 in., while the Model CS-35 is offered in 136, 160 and 175-in. wheelbases. The six-wheeler Model CS-35-T is built in two wheelbases, 168 and 180 in.

All of these models are powered by six-cylinder engines of International Harvester design and manufacture. The Model CS-30 engine is of the L-head type, with dome-type combustion chambers. At 3400 r.p.m. this engine develops 78.5 b.h.p., with a maximum torque of 151 lb.-ft. at 800 to 1400 r.p.m. Bore and stroke are $3\frac{5}{16}$ and $4\frac{1}{8}$ in. respectively. The clutch is of the single-plate type, with built-in vibration damper, and the transmission has four speeds forward and one reverse, giving a total of eight forward and two reverse speeds when employing the two ranges of the rear axle.

The Model CS-35 powerplant is of the valve-in-head type, with replaceable cylinder liners. Bore and stroke are $3\frac{7}{16}$ and 4 in.



Showing frame of six-wheel chassis supported on half-elliptic springs carried on saddles which in turn are pivoted to walking beams

A simple movement of the shifting lever gives the driver of new trucks made by International Harvester a choice of 8 forward speeds. This is accomplished by a combination of a four-speed transmission with a two-speed rear axle, which gives clearance of conventional types and adds little weight to chassis.

3 New Truck Models

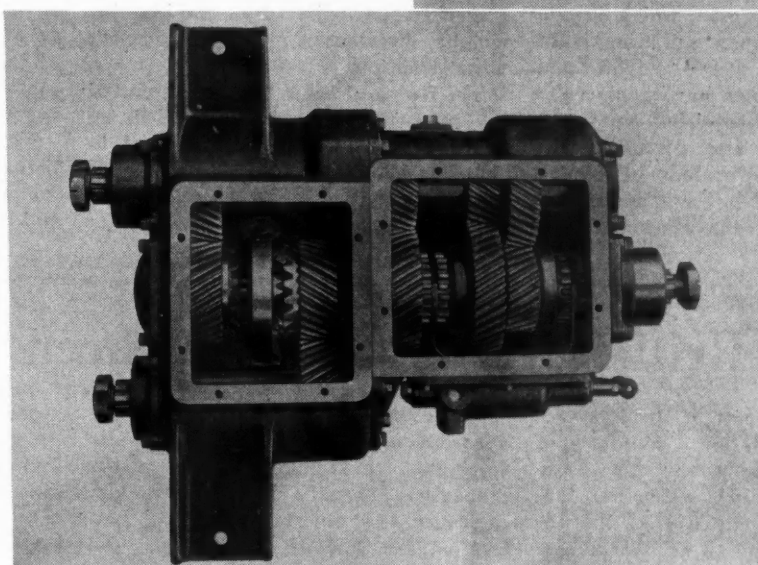
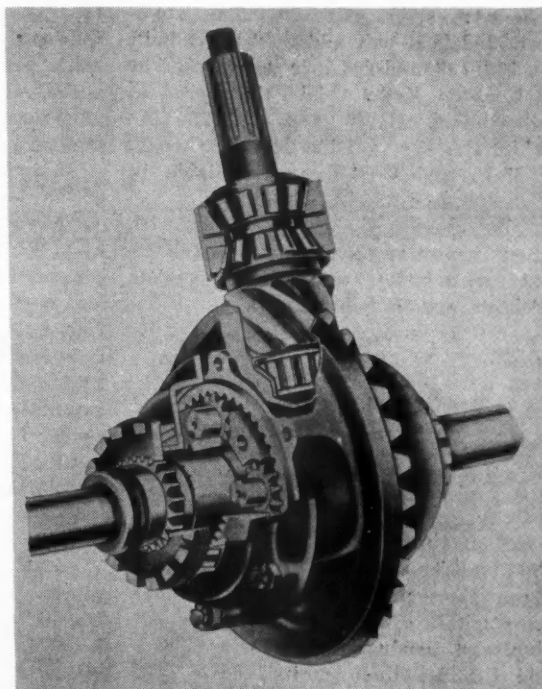
respectively. This power-plant develops 160 lb.-ft. torque at 800 to 1500 r.p.m. and a maximum output of 78 hp. at 3400 r.p.m. The same engine is employed in the six-wheel Model CS-35-T.

Transmissions in the CS-35 and CS-35-T have four forward speeds and one reverse, and are equipped with five anti-friction bearings. Clutches are of the single-plate type, with built-in vibration dampers.

The International dual-performance axle consists of a straddle-mounted spiral-bevel drive pinion, a differential carrier assembly mounted on roller bearings, full-floating axle drive shafts, and the shifting mechanism, fully enclosed in a rigid one-piece cast banjo-type housing. The differential carrier assembly incorporates a spiral-bevel ring gear, a supplementary planetary reduction gear set, and the usual four-pinion differential unit. The planetary set effects a speed reduction between the large bevel gear and the differential unit. When the truck is operating in its high-speed range, the planetary set is locked and revolves with the differential ring gear, the engine driving directly through the drive-shaft pinion and the ring gear to the axle shafts.

When the planetary set is free to revolve, four small spur pinions, which are in constant mesh with an internal gear forged integral with the ring gear, roll on the internal gear. These

Cutaway view of International two-speed rear axle



Power divider of dual-drive six-wheelers

pinions are also in constant mesh with a central spur gear integral with the sliding sleeve which surrounds the left axle shaft. In this position, the drive is through the drive-shaft pinion to the ring gear, through the internal gear to the four small pinions, and thence through the pinion-carrier plate secured to the differential case, to the axle shafts.

When the shifting lever is pulled back, a reduction of wheel speeds takes place. When it is pushed forward the planetary gears cease to operate, wheel speed is increased, and the truck runs in the high-speed range.

The planetary reduction turns at axle-shaft speed, and its gears are lubricated with the same oil as the rear

axle. The road clearance remains the same, and the added weight is said to be small.

Six-wheel trucks have been in production by the International Harvester Company for some time, but only on a limited scale. Now the production of these models is to be greatly increased.

The International six-wheelers are of both the trailing-axle and dual-drive types. In the following listing of these models the suffix letter "T" indicates the trailing-axle type, and the suffix "F" indicates the dual-drive type. The 1½ to 4-ton Models C-35-T and CS-35-T are available in two wheelbases each—168 and 186 in. The Model CS-35-T is like the Model C-35-T, except that it

has a two-speed rear axle. The 2 to 5-ton Models C-40-T and C-40-F are built in 168, 186, and 204-in. wheelbases. The 3 to 6-ton Model C-50-T is offered in wheelbases of 170, 188, and 206 in., while the 3½ to 7-ton Models C-55-T, C-55-F, and C-60-T are available in 170, 206, and 224-in. wheelbases.

The various six-wheel models with their respective chassis weights (shortest wheelbase) and gross vehicle weights are as follows:

Model	Chassis Weight	Gross Vehicle Weight
C-35-T	5,050	16,500
CS-35-T	5,125	16,500
C-40-T	6,100	21,500
C-40-F	6,600	22,000
C-50-T	7,718	26,500
C-55-T	9,030	33,000
C-55-F	9,705	33,700
C-60-T	9,105	33,000

All of the six-wheel trucks of both the trailing-axle and the dual-drive types are equipped with six-cylinder powerplants of the company's own design and production. Models C-35-T and CS-35-T have engines of 3 7/16 by 4-in. bore and stroke, which develop 78 b. hp. at 3400 r.p.m. and a maximum torque of 160 lb.-ft. at 800 to 1500 r.p.m. All of these engines have replaceable cylinder liners and precision-type interchangeable main and connecting-rod bearings. The powerplant of Models C-40-T and C-40-F is the same as that of C-35-T, but the transmissions of these

two models have five instead of four forward speeds. Helical constant-mesh gears are used for the third and fourth speeds of C-40 series. There are five antifriction bearings in each of these transmissions.

Of similar design are the powerplants of the C-50-T, C-55-T, C-55-F and C-60-T. The engine of Model C-50-T has 3% by 4½ in. cylinders. It develops a torque of 190 lb.-ft. at 800 to 1600 r.p.m. and a maximum output of 82.5 hp. at 2800 r.p.m. The engine of the C-55 and C-60 series develops 90.4 hp. at 2800 r.p.m., its governed speed, and has a maximum torque of 213.5 lb.-ft. at 800 r.p.m. This engine has a total displacement of 298.2 cu. in. and cylinder dimensions of 3¾ by 4½ in.

The rear-axle assembly is arranged with a view to keeping the axles parallel with each other, a fixed distance apart, and the wheels parallel with the frame; to make possible a free up-and-down independent movement of the wheels so as to compensate for road irregularities without disturbing the weight distribution or reducing the wheel traction.

The frame of the vehicle is supported on semi-elliptic springs, carried on saddles which are in turn pivoted to the equalizing beams, as shown in one of the accompanying illustration. The truck frame is supported at two points

on each side. Pivoting of the saddles to the equalizing beams below the line of axle centers further aids in the absorption of torsional stresses. This assembly is said to make it possible to use springs which while adequate to support the maximum loads for which the truck is intended, are not unduly stiff.

Axle housings are prevented from tilting forward or backward by torque members having ball-and-socket connections to a substantial frame cross member and to the tops of the axle housing.

In the dual-drive rear end, the problem of compensating for differences in the tire size (due to different makes, various air pressures and wear) and which is a problem peculiar to this type of six-wheel vehicle, is solved by the use of a third or auxiliary differential. The power is divided ahead of the driving axles by the use of a power divider which contains the third differential. A unique feature of this power divider is that it also includes an auxiliary over and under-drive unit, all the gears of which are of the helical, constant-mesh type, lapped in for quiet operation.

The rear four-wheel drive installation and connecting parts of the trailing and dual-drive units are similar and are built into the chassis.

British Automobile Research Grows

IN the annual report of the Research and Standardization Committee of the Institution of Automobile Engineers (Great Britain), which has just been issued, it is stated that the Institution is planning to acquire a new and larger laboratory, since the present laboratory facilities in Chiswick (London) have been outgrown.

The main investigations in progress at the Chiswick laboratory at the present time are as follows: Cylinder wear; valve-seat wear; wear and cracking of bearings; the frictional and wearing properties of brake linings and brake drums; brake squeak, and the corrosion of ball bearings in storage. Outside researches were continued at the laboratory of Ricardo & Co., Ltd., on lubricating oil consumption, and cooperation was maintained with the research being carried out at Manchester University on piston temperatures and with the investigations at the National Physical Laboratory on road impact. In addition, a contribution was made toward a research at the National Physical laboratory on the fatigue of cast crankshaft materials.

During the year the research on

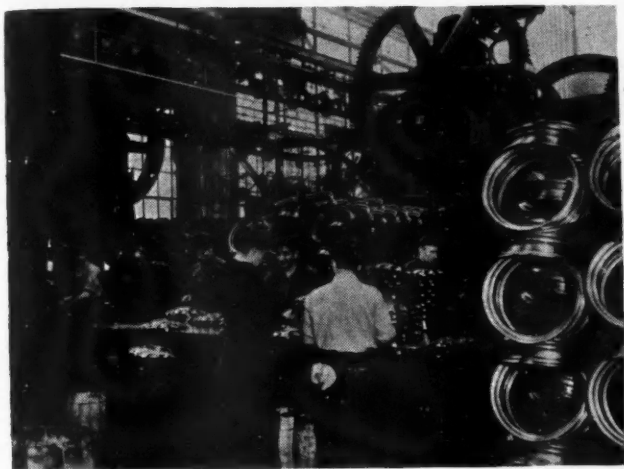
cylinder wear was continued, and the abrasion aspect was particularly investigated. A study was made of the influence of engine load, piston-skirt clearance and several piston-ring factors on the rate of wear. From the standpoint of lubrication, a basic research was carried out on the influence of various constituents of a lubricant on the wear by abrasion and corrosion. This was done by running engines on medicinal kerosene to which various fatty acids, fatty oils, etc., were added. In this way considerable insight was gained into the essential requirements of cylinder lubrication.

Two machines were operated continuously in a research on big-end bearings, the principal object of which was to determine the relative importance of various factors in causing wear and cracking of bearings. One machine was operated at a mean bearing pressure of 1000 lb. per sq. in., and over a wide range of temperatures, the wear being determined with oils of various viscosities, so that the two factors of temperature and viscosity were under consideration. The other machine was operated at the much

higher mean pressure of 3000 lb. per sq. in., under which conditions it was found that the phenomenon of cracking can be readily observed. Experiments are being carried out on a number of bearing metals, backing materials, crankpin materials, etc.

Some very useful data were obtained in a research on oil consumption carried out for the Institution by Ricardo & Co. A study was made of the influence of the following factors on the oil consumption: Piston-ring side clearance, piston-ring radial pressure, clearance behind rings, ring gap, engine load with varying piston clearances, cylinder temperature, turbulence, and fuel-air ratio.

DR. HANS TROPSCH, co-inventor of the Fischer-Tropsch process for the hydrogenation of coal (synthetic production of gasoline) died recently at Muhlheim-on-Ruhr, Germany, at the age of 46. Recently he had been chief chemist of an American petroleum company with headquarters in Chicago, and he was on a European trip at the time of his death.



The production of spoke-type wheels for Chevrolet Master de luxe and Standard models

PRODUCTION LINES

Better Ride

One of the better known parts people hereabouts is demonstrating a new front end system consisting of a sway bar, connector links, and direct acting shocks in a single unit. The sway bar is mounted in heavy rubber blocks which is said to kill much of the road noise. Quite a number of engineering organizations are said to be aquiver over this development. It's said to produce a marvelous ride. Thoroughly covered by patents.

Molded Finish

Durez Molder recently pointed out that the only sure way to get a good, smooth, bright finish on molded parts is to permit them to cool in the mold. The trend today, because of the desire to speed up production, is to eject the work without cooling. Wherever smooth finish is essential it may be better to slow down the operation and cool the work in the die.

Fuel Filter

Within a couple of weeks we expect to see an announcement of a new filter designed for purifying Diesel fuel oil. It is claimed to be so efficient that it will definitely protect fuel pumps and increase their life. Which should be good news for Diesel truck operators.

Meet Alnico

Some of you may have read the newspaper reports recently about a new magnetic alloy developed by General Electric. According to the *Aluminum News-Letter* for November, Alnico is a permanent magnetic alloy containing aluminum, nickel, and cobalt. It is so

powerful, magnetically, that it lifts 60 times its own weight. This material is expected to replace the customary electromagnets by simplifying construction and reducing costs.

Versatile Metal

Of all metals the most resistant to acid corrosion, Tantalum automatically rectifies an alternating current, maintains vacuums through its gas absorptive properties, has a melting point of 5160 deg. F., and a tensile strength of 130,000 lb. per square inch. Tantalum welds readily and is extremely ductile when cold. As Tantalum Carbide, it forms a cutting edge of low thermal conductivity superior to any material known for the machining of most metals including high-manganese steels, according to Fansteel Metallurgical Corp.

Design Progress

The best way to judge how far passenger car design has progressed is to drive many of the new cars and then compare performance with an older job. This we have done. And we can tell you that our own car which we considered one of the best of '33 hasn't got what it takes to make an acceptable car for the '36 market.

New Day

That trailer manufacture graduated from the blacksmith stage a long, long time ago is evident once you walk through the Freuhauf Trailer plant. Despite the fact that their work is practically all custom tailored, they have a very business-like and modern manufacturing shop. Perhaps the most im-

pressive thing is a view in their body building department, which, on the day we called, was filled to the gunwales with the biggest variety of bodies we have ever seen in one place. Three of them were fitted with an aluminum skin to increase pay load. We also saw three trailer chassis fabricated from aluminum shapes and plate. Apparently more fleet operators are beginning to appreciate the economic value of the new light-weight engineering materials.

Latex Plates

During a recent visit to the Firestone mechanical rubber plant, we were shown a little department which produces latex separators used in their new line of batteries. Needless to say, we appreciated the courtesy since this particular activity is new and not open to visitors generally. These separators replace the customary wood separators, thereby making the battery a little lighter and somewhat more compact. The curious thing about these separators is that although they have ideal dielectric qualities, the material is so porous that the electrolyte can circulate freely and without restriction.

Battery-Wise

Recent correspondence indicates that the car engineers are very much interested in new developments in starting and lighting batteries. Packard's Prest-O-Lite battery which requires service only a few times yearly has attracted a good deal of attention. Now we learn that a medium-priced car is to come out very soon with a high capacity battery which requires but little attention and as a special feature it's built with the cell connectors entirely enclosed within the battery.

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AUTOMOTIVE ABSTRACTS

Noise Limit for New Vehicles Suggested in Great Britain

THE Committee on Motor Vehicle Noises of the Department of Transport (Great Britain) has made an interim report in which the following conclusions are arrived at:

The average present-day motor car under ordinary conditions of use is not unduly noisy. Certain types of sports cars are too noisy. Except at moderate steady speeds, certain types of motorcycles are too noisy, as a result, no doubt, of the great ratio of power to the size of the machine. Certain commercial vehicles are somewhat noisy, but improvements could be effected by attention to engine and gear noises.

The Committee recommends that after August 1, 1936, no new vehicle shall be sold in Great Britain unless it can pass the following test: In the normal running test, when the vehicle is being driven under full throttle at 30 m.p.m., using the gear preferred by the driver, the loudness measured at a point 18 ft. to one side of the vehicle shall not exceed 90 phones. In the running engine test, when the vehicle is stationary, with the engine running at the speed which would give maximum power output, the loudness 18 ft. behind the exhaust pipe shall not exceed 95 phones. The phone measurement has as its zero the threshold of audibility, and at a value of 130 phones a feeling of pain. A loudness of 95-95 phones corresponds to the noise in a subway train with the windows open. It is suggested that in the case of motorcycles and commercial vehicles the noise limit be relaxed to the extent of 5 phones for two years, in order to give manufacturers time to improve their product without disturbing manufacturing schedules. It is further recommended that the practice of racing the engines of stationary vehicles be prohibited.—*The Engineer*, Oct. 25.

Railcars Exhibited at Brussels

AT the World's Fair in Brussels numerous railcars were exhibited. A car of the French Renault firm showed several improvements over previous types. It was equipped with a twelve-cylinder four-stroke Renault Diesel engine of 5.51-in. bore by 6.70-in. stroke, developing a constant output of 265 hp. at 1500 r.p.m. and a maximum of 292 hp. The engine is combined with a gearbox giving four forward speeds and with a separate reversing gear comprising an assembly of three bevel gears, the two driving bevel gears being loose on the transmission tail shaft and secured thereto by positive clutches. From the reverse gear a short shaft extends downward to another pair of bevel gears, and from the latter a shaft extends forward to a pair of spur gears of which the driven member is secured to the stem pinion of the bevel-gear driving set of one of the driving axles of the truck. Both axles of the truck are driven by bevel gears, the two stem pinions being connected by a propeller shaft with universal joints. The fuel consumption was given as 0.53 lb. per hp.-hr. Renault also

showed a two-car articulated train with power units on the two end trucks. The two engines develop a total of 530 hp. and the train is said to have a maximum speed of 90 m.p.h. on level tracks. It has a total length of 141 ft., accommodates 88 passengers, and weighs 50 (metric) tons empty and 65 tons loaded.

Bugatti also exhibited his gasoline-engined railcars, of which descriptions and illustrations have appeared in earlier issues of *AUTOMOTIVE INDUSTRIES*. The only change made is that the power output of each of the four engines has been raised to 250 hp. (from 200), and the speed of the car increased to 119 m.p.h.

De Dietrich & Cie of Niederbronn, Alsace, exhibited a railcar having a Diesel engine on each truck. The engines were of the four-cylinder, two-stroke, opposed-piston type and develop 110 hp. each at 1500 r.p.m. Each engine drives one of the two axles of its truck through a transmission of the constant-mesh type. Starting of the engines is effected by means of electric starters supplied with current from a 24-volt cadmium-nickel battery of 143 amp-hr. capacity. The transmission gives four speeds in both directions of motion and is pneumatically controlled. Triple brakes are provided. The train can be brought to a stop (1) by hydraulic-pneumatic brakes acting on drums on the wheels; (2) by hand brakes acting on the driving axles of the trucks, and (3) electro-magnetic shoe brakes. In addition, the engines can be used to hold the car in check on down grades.

Descriptions and illustrations are given also of a Sentinel steam-propelled railcar built in Belgium, the Fiat Littorina gasoline engine railcar, the Fiat Diesel railcar and the Breda (Italian) Diesel railcar equipped with Wilson planetary transmission and Vulcan-Sinclair hydraulic coupling.—*Le Génie Civil*, Nov. 9.

Improvements in Piston Rings

IN the production of piston rings the tendency has been toward improved material and improved workmanship. As regards material, it has been recognized that finely divided graphite, while it possesses certain advantages from the standpoint of tensile properties, does not convey good wear-resistance properties. It has been found also that a graphite distribution approaching fiber form in the photomicrograph, improves the wearing qualities. In the past it was also one of the rules not to let the phosphorus content exceed 0.3 per cent, because it was known that phosphorus has a tendency to make the material brittle. There was some reason for this rule when the tensile strength of cast iron was very low; but now, that improved cast irons with tensile strengths of from 42,000 to 65,000 lb. per sq. in. are available, a slight increase in the phosphorus content is of no importance from the standpoint of tensile properties. The higher phosphorus content improves the wearing qualities, but only when it is uniformly distributed over the whole area in the form of a phosphide grid. It seems that this phosphide grid has an oil-adsorbing property and helps to maintain the oil film necessary to keep down the rate of wear.

Cast iron for piston rings should be hard, but not too hard. It must be hard in order to have the necessary tensile properties; and it must not be too hard as in that case it would unduly wear the cylinder bore. It must be fine-grained, because otherwise it cannot have the required tensile properties, yet not too fine-grained, in order that it may be sufficiently wear-resistant.

Up to some years ago most piston rings had a diagonal



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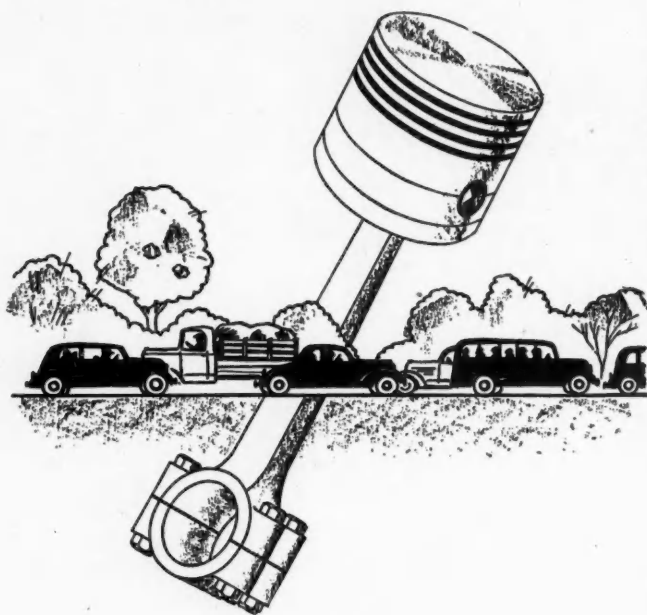
"Improved appearance" was the most universal claim at the 1935 Automobile Show. And the most universal new design feature was the ZINC Alloy Die Cast radiator grille. Die castings give these new cars an appearance of solidity, a structural integrity, which they have never gained by any other method of fabrication. The possibility of ZINC Alloy Die Castings doing an equally important job for you should be carefully investigated.

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More Than Ever

With the introduction of the new car models during cold weather, more than ever does it behoove manufacturer and dealer alike to bend every effort toward the protection of the vitals of automotive engines.

The heavy strain which cold weather starting places on the friction parts can be materially relieved by proper attention to lubrication.

The addition and use of "Oildag"* Brand colloidal graphite (in oil) in both crankcase and top cylinder lubricants forms on these moving parts a very closely bonded lubricating surface. This surface cannot be washed off by raw gasoline and is not affected by the temperatures which exist in the combustion zone. Hence, during that period when the engine is turning over with very little or no lubrication, the graphoid surface safeguards against metal-to-metal contact till full film lubrication is gained.

The set-up and assembly of engines with Acheson's colloidal graphite (a procedure being followed by more and more manufacturers) is an important initial step in protection. Engine builders can go further and recommend to their dealers the use of this material before new car deliveries.

Send for Technical Bulletins A112 and B242.

*Reg. U. S. Pat. Off.



December 28, 1935

joint, the latter having replaced the lap joint of an earlier period. At present a great many rings have a straight transverse gap. The opinion used to prevail that leakage through the gaps of the rings could be effectively stopped by alternating the direction of the diagonal gaps so that the gases would have to follow a zig-zag course in escaping from the cylinder through the ring gaps. Experiments have shown, however, that there is no difference in the leakage when the gaps are unidirectional and when they are alternated. On the other hand, there is a certain disadvantage in the diagonal cut, in that it produces a lateral pressure on the ring near the ends, which results in increased wear on the sides of the ring near the cut. It is also claimed that vibration of piston rings at high speeds is promoted by the diagonal cut. One argument that has been advanced against the ring with straight transverse gap is that it tends to form a ridge on the cylinder bore; experience, however, has shown this contention to be untenable. It is important, of course, that the width of the gap be made as small as possible and still avoid jamming under severe operating conditions.—*Der Ate Ring*, No. 9, 1935.

Glare Characteristics of Road Pavements

IF artificial lighting of main highways is to be widely adopted, the reflection characteristics of road pavements will become of great importance. It was pointed out by M. Gibrat, an engineer of the (French) Department of Mines, in a talk at Nevers some time ago, that certain materials are exceedingly good reflectors of light when the rays are nearly parallel to the surface. Thus a dark asphalt surface may become 100 times as bright as the same surface covered with snow. All that is necessary to bring about this effect is that the light be directed at the road surface at a suitable angle. Quite extensive experiments on this subject were made in France recently, at the request of the Paris Municipality, by M. Cohu, head of the experimental department of the Compagnie pour le Perfectionnement de l'Eclairage. M. Cohu measured the brilliance or brightness factor, that is to say, the ratio of the brightness of the road to its illumination. This factor varies in phantastic proportions, since for the same material (asphalt, for instance) it varies between 1/100 and 300. In certain directions asphalt diffuses light 30,000 times better than in other directions. It is therefore not surprising that by taking advantage of these properties one may obtain a very high degree of brightness at low cost. Thus M. Waldram in England with the same pavement was able to obtain a brightness of 7 equivalent lux, whereas by following the traditional principles he obtained a brightness of 5 lux with four times the current consumption.—*Le Génie Civil*, Nov. 9.

Council for Transportation Company Disputes

IN Great Britain a Transport Council has been appointed to deal with conflicts between competing systems of transportation. Apparently it is to do for Great Britain what the Motor Carriers Division of the Interstate Commerce Committee is to do for the U. S. In his presidential address to the Institution of Transport (of Great Britain), Sir Cyril W. Hurcomb, referring to the work of the Transport Council, said it brought together the leaders of all branches of transport under an impartial chairman, in an atmosphere which should help to fulfill the hope that the well-being and orderly growth and development of transport of a great public service could be advanced by friendly interchange of views and the responsibility of jointly devising ways and means of overcoming difficulties and resolving differences.—*The Engineer*, Oct. 18.

Automotive Industries

AUTOMOTIVE INDUSTRIES

Editorial Index to Volume 73

Issues of July 6 to December 28, 1935, Inclusive

Subject Index—Below

Company Index—Page 10
Associations—Page 15

Authors' Index—Page 9

Date	Pages
July 6	1-32
" 13	33-63
" 20	65-94
" 27	95-124
Aug. 3	125-156
" 10	157-186
" 17	187-217
" 24	219-246
" 31	247-276

Date	Pages
Sept. 7	277-344
" 14	345-374
" 21	375-402
" 28	403-432
Oct. 5	433-465
" 12	467-498
" 19	499-533
" 26	535-564

Date	Pages
Nov. 2	565-608
" 9	609-640
" 16	641-672
" 23	673-702
" 30	703-736
Dec. 7	737-771
" 14	773-804
" 21	805-835
" 28	837-868

Index of SUBJECTS Mentioned in Automotive Industries

A Automotive Abstracts

Alfa Romeo racers, 2 engines	56
Automatic injection advance	766
Bosch pneumatic governor for Diesels	117
British "ribbon-building" act passed	495
Bronze and white metal bearings fail, How	56
Cathode ray engine indicator, New type of	493
Centrifugal clutch which permits engine braking	147
Chrome-plated cylinders	147
Clutch and accelerator pedals combined	690
Contact materials	492
Council for transportation company disputes	868
Daimler light 20, New	275
Damping torsional vibration—effects on bearing loads	238
Detonation in Diesel engines	659
Economics of air transport in Europe, Report on	239
Engine-testing practice in England, Routine	370
England puts 8 pence tax on Diesel fuel	370
European transcontinental highway	690
Eyston's front drive racer with Rolls-Royce engine	274
Fiat 6-cyl. car, New	274
Fluid flywheels and hydro-kinetic transmissions	182
French engineers argue aluminum prices	275
Fuel taxes worry French engineers	186
Gasoline dope	691
German automotive standards are obligatory	637
Glare characteristics of road pavements	868
Hitler puts copper and nickel on "verboten" list	181
Hillman minx 4-cyl. model	659
Hungarian rail cars	637
Industry battles dumb driving on broad front	198
Nitriding, Broader field for	275
Noise campaign	690
Noise limit for new vehicles suggested in Great Britain	866
Organization of industry	492
Piston rings, Improvements in	866
Progress of motor vehicle industry in Great Britain	146
Racer with radial air-cooled engine	690
Railcars exhibited at Brussels	866
Resistance of spring steel to repeated impact stresses	181
Reverse flow scavenging tests on DKW 2-stroke engine	766
Russian motor exports	147
Six new Diesels	691

Solex carburetor has built-in inertia governor, New	117
Starting devices for Diesels	146
Steel prices in England	628
Streamlining of racing cars	116
Supercharger of Roots type	691
Tercentenary of Robert Hooke	181
Tests Diesel with electrical ignition	668
Tests on air-resistance coefficients	493
Top speeds and accelerations of front and rear drive cars	274
Tractors in England	181
Translation available on two-stroke engines by Dr. Herbert J. Venediger	668
Trolley buses for London	659
"Waisted" screws, Advantages of	370
Wind-tunnel testing of small scale car models, Hints on	116
Wolsley, New 14 hp.	239
Worm-gear individual drive to each wheel	628

Accessories, Vehicle—See also Parts; Aircraft Parts & Accessories

Air-conditioning system now available for motor vehicles	605
Anti-skid liquid	255
Compressor operates from truck engine	465
First aid kits as car equipment urged	611
Hot water heater	276
Neon turn signal	214
Pontine upholstering fabrics	638
Recessed head replaces screw slot	638
Refrigeration for perishable goods	804
Tire inflation system is developed, Continuous	276

Advertising

Arnold opens new offices	39
Buick advertising account transferred to Erwin Wasey	72
Buick to broadcast Baer-Louis fight	347
Chevrolet used car advertising boosts dealers' sales	405
Kodner gets Buick, Fisher, GM and Goodyear accounts	191
NADA flays FOB price advertising as misrepresentation of delivered prices	187
November show-advertising linage	643
Thompson gets Nash car account	346

Aviation

Air transportation gains	777
Aircraft propeller brake developed by US engineer	97
Bureau of Foreign & Domestic Commerce to stage exhibit at aircraft show	36
Flapped cowl control of aircraft engine cooling mostly solved, Problems in	14
Fleet to build all export planes at Canadian plant	776

Flying boats, Improvements in	213
Fuel and oil consumption of aircraft	362
Imperial Airways has three radical new types under construction	708
Mail, passengers, express carried by 26 plane companies	644
Mitchell charges incompetency hampers aeronautical advances	738
Planes to feature aircraft show, Sports, business	72
Slushing compound protects aircraft motors, New	808
Structural failure not cause of Boeing crash	709
Terraplane engine endurance test satisfactory for aircraft	404
Travel in the stratosphere made alluring by Caquot	796
United Aircraft companies consolidate into one corporation	3
U. S. Air Corps looks to Congress for grant to continue, procurement plan	738
U. S. second in world air record standing	782

Aircraft Engines

General Aircraft gets Hispano-Suiza rights	103
GM's Allison division to build aircraft engines in new plant	98
Multiple ratings necessary for modern aircraft engines	794
Pratt & Whitney to designate engines by cruising power rating	97
Trends in large air-engine design discussed at a symposium	758

Aircraft Parts & Accessories

Scintilla aircraft battery ignition	630
-------------------------------------	-----

Batteries

Alkaline type battery, New	734
Chemical reactions in the lead storage battery	12

Bearings

Ball thrust bearing of unusual diameter	156
Bearings, Precision ball	326
"Greaseal" extends bearing size line	92
Lubrication film and bearing design correlated, Relation of	795
Marlin-Rockwell super bearing permits 50,000 R.P.M.	304
Norma-Hoffmann bearings sealed	804
Timken bearings improved, Surface finish of	366

Bodies

Automobile quieting	209, 429
Budd develops new all-steel body construction	557, 757
Monroe products, New	768
Nukraft upholstery material	803

Book Reviews

- ALB operations analyzed critically 188
 ATZ Beihefte, Sammelband I (ATZ Supplements, Collection I) published by Frankische Verlagsbuchhandlung, Stuttgart-Q, Germany 800
 Automotive Book List of 1934, published by Kiasing & Co., Berlin 360
 Cracking Art in 1934, by Gustave Egloff and Emma E. Crandal, published by Universal Oil Products Co., Chicago 564
 Diesels, Development of (German) ... 16
 Diesel Engines by J. W. Anderson, published by McGraw-Hill Book Co., N. Y. C. 695
 Dissociation of Gases of Combustion, published by V.D.I. Verlag, Berlin NW 7 564
 Facts and Figures for '35 133
 Frictional and Leakage Losses with Piston Rings, by Dr. H. Ing. M. Eweis, published by V.D.I. Verlag, Berlin, NW-7 91
 Hutto Issues Bulletin 81
 National Standard Screw Threads 242
 Patents, by Everett G. Wright, Patent Attorney, Published by Patents Publishing Co., Detroit 732
 Presswork Pressures, by C. W. Lucas, pub. by McGraw-Hill Book Co., Inc., N. Y. C. 692
 Symposium on Paint and Paint Materials 360
 "Timken Engineering Journal," Third edition of 81
 Vestpocket Diesel Manual, Diesel Publications, Inc., New York 552

Brakes

- Bendix-Westinghouse air-brake equip't 328
 Brake lining sales up in '34 over '33 ... 71
 Brake lining sales up first six months. 611
 Canadian Show to reveal new vehicle brake system 134
 Linderman brake system, Fluid actuation feature of new 245
 Resins, improved brake lining 496

Buses

- Auburn line of limousine-type bus 440
 Buses will inevitably replace street cars by public demand 826
 McCord bus air-conditioning system ... 258
 More N.Y.C. trolley cars bow to buses 674
 N. Y. buses to carry 114,806,840 in year 730
 N. Y. railways would replace cars with buses 184
 Rear and under-chassis engines increasingly popular in bus field 120

Business Conditions

- August shut-downs increase industry's lay-off rate 476
 Automotive freight revenues show big increase for railroads, Swayne says. 574
 Automotive gains in output, payrolls, employment lead nation to recovery 468
 Boost schedules, Many plants 433
 Car demand taxes plant capacities 673
 Cars in wholesale class gain in 9 mos. production 540
 Chevrolet increases output capacities ... 499
 Confidence rises as shows approach ... 535
 Dealer franchise must be profitable one, Average 66
 Dealers (average 359 NADA members) lose \$14.76 per new car 127
 Dealers selling five or less cars in '34 ... 163
 Early plates would aid new car sale ... 433
 Employers show leadership to labor, New crisis demands 830
 Farm exports expansion linked with domestic recovery 676
 Fewer insolvency cases mark industry's recovery 705
 Freight created by car industry 70
 Industry studying probable results of lower railroad rates 779
 Knudsen sees bigger car markets, etc. 165
 Low cost prosperity 446
 MEMA reports decline in 3 or 4 major index divisions for August. 473
 NADA reports dealer's net "operating" profit 353
 National income rises in '34 195
 Net worth of 16 car makers reduced in depression years 53
 New lines and more branches help NSPA jobbers expand sales in '34 ... 213
 New model introductory plan reflected in August wholesale, retail financing. 501
 New model orders near record 499
 100 million automotive dollars for capital goods in '35 284
 Parts shipments lower as new models near 164
 Sept. dollar volume index off 20 points 536
 Sharing of income, Mechanization's aid in 46
 What has the future for the youth of America? 49

C

Car Descriptions—See also Truck Descriptions

- British models reveal no fundamental changes in '36 409
 Buick's 1936 line—prices 416
 Cadillac offers smaller 8 for '36 478
 Chevrolet adopts hydraulic brake and improves cooling system 580
 Chrysler models for '36 have longer, stronger bodies, Four 554
 Cord with new system of independent suspension, Front drive 582
 DeSoto '36 restyles airstream and air-flow models 598
 Dodge line, New hood and fender treatment marks the 1936 515
 Fiat has small model reminiscent of Willys 77 23
 Fords, Easier steering, all silent transmission, pressed steel wheels feature the new 512
 Ford V-8 for British, Smaller 471
 Graham-Paige concentrates on sixes 600
 Hudson "Duo automatic Hydraulic braking" for '36 550
 Hupp '36 bodies and chassis 595
 Lincoln-Zephyr a V-12 on 122 wb. 592
 M. G. racing car has tuning fork frame 16
 Nash offerings, Three new models supplement earlier 603
 Olds adopts aluminum pistons and improves engine mounting 553
 Packard 120-B more powerful 424
 Pierce-Arrow offers eights and twelves 604
 Plymouth improves its steering gear and front suspension for '36 548
 Pontiac line, Nineteen body styles on three models make up new 516
 Reo line for '36 591
 Russian "Zis" car an 8-in-line 677
 Specifications, 1936, Condensed engine and chassis 602
 Stout announces a new Scarab 601
 Streamlined car built by Morrison 197
 Studebaker six and eight for '36 586
 Terraplanes have longer wheelbase and front axle torque arm 596
 Tjaarda rear engine car 502
 Willys-Overland has 6 body styles 590
 Yellow cab wheelbase, New 67

Carburetors

- Carburetor, New type 771
 Tillotson downdraft carburetor has velocity control 211

Cleaners, Air & Oil

- Water and oil separator 497

Contests

- Campbell drives Bluebird 301 m.p.h. ... 333
 Chevrolet gas economy run 340
 Indianapolis rules for '36 cut fuel and permit superchargers 99
 Jenkins in Duesenberg beats Cobb's mark 346
 Salom and Duryea 679
 Speed records, Announce new 774

Corporate Changes

- Albion buys Halley plant 747
 Aluminum Industries buys Dall Mfg. Co. 675
 Auto-Lite acquires bumper and die casting factories 161
 Auto-Lite to dissolve Moto Meter Gauge Corp. 411
 Automatic Products buys Aeriet Air Conditioning 101
 Briggs buys Johnson Motor Co., Report 709
 Carburetorum acquires Hutto 133
 Directors OK merger of Inland and Ryerson 197
 Fansteel changes name 378
 Firestone sells subsidiary to U. S. Rubber Products 709
 Hill buys Canton Foundry 40
 Inland Steel Co. to vote on merger... 350
 Kellogg reorganized 645
 Raybestos-Manhattan acquires Multi-bestos 349
 Red Cap Battery Co. sold 505
 Rodgers agency merges 128
 Simplex Piston Ring Co. now Simplex Products Corp. 355
 Toledo Synthetic Products, Inc. to change name to Plaskon Co., Inc. ... 839
 Torrington-Bantam merger announced 410
 Whitney will change corporate name .. 843

Corporations, New — See also Corporation Changes

- Abbott forms research company 707
 Bondall Co. formed to make new brake lining 837
 Ferry Products Co. begins operation in Cleveland 71
 National Auto Products Co. formed... 220
 Rasmussen Machine Co. formed 384
 Tunstall Steel to produce sheets, forgings, for Austin cars, Organize 776

Chassis

- Plymouth designs new frame to resist twisting force 491

D

Design—General Trends

- Accents on safety cover many points in '36 automobiles 848
 Design trends stimulate interest in powerplant-drive units, 233, 264, 456, 489, 522
 Detroit SAE discusses '36 cars, design trends 570
 Domestic-Foreign car design trend similar 611
 Loading of trucks, Economical 531
 Propose cars without reverse 552

Diesel Engines

- Blower used on Maybach diesels, Centrifugal type 514
 Combustion reactions in diesels studied by Boerlage, Associates 794
 Diesel combustion, NACA studies on ... 382
 Diesels for the Zeppelin 661
 Diesel fuel pumps with declining delivery-speed characteristic best in vehicle service 136
 Diesels in smaller power ranges 688
 Diesels to be displayed at show, New types of 470
 Fuel testing, diesel costs dominate API-SAE coast meetings 720
 Gardner diesel engine 421
 Germany builds diesel motor developing 1200 hp. 470
 Hercules adds 250 cu. in. 6-cyl. diesel 273
 Hercules gasoline-engine starters for Diesels 362
 Measuring the scavenging efficiency of 2-stroke diesels 858

Drives—See Transmissions, Machine Tools

E

Electrical Equipment, Automotive—See also Parts and Accessories

- Electrical-load data on 1936 cars 746
 Headlight bulb, New bar-filament 768

Employment

- August motor employment drops below July 410
 Automobile employment accession rate leads U. S. 566
 Automotive labor turnover rates per 100 employees 127
 Automobile labor turn-over trends reversed by fall production plan 773
 Budd employing largest total of men since '33 545
 Buick workers average employment in '35 332
 Chevrolet plant reopening boosts Toledo employment 737
 Discharge, hiring rates lower in motor industry 34
 Earnings rose, man-hours declined in September 610
 Employment and payroll indices above production curve for motor industry 568
 Employment decline exceeds payrolls for second month 407
 Fewer automotive workers lost employment in July 333
 Fisher wages, improvement bill 610
 Ford's new steel mills begin operating in September 223
 GM Los Angeles plant work starts Dec. 1 568
 GM to adjust work roster to regularize employment 677
 GM to experiment on work stabilization 610
 Jobs provided by new industries, More than a million 108
 July man-hour analysis of employment, output, payrolls, by APEM shows up-trend 471
 McCord payrolls rise, employment gains 73
 October employment rose 747
 Olds and Fisher Lansing plant operations at peak 837
 Payrolls behind April, Average May work week 38
 September motor employment drop less than payrolls 567
 Show start of cooperative employment experiment 405
 Toledo employment gains 543
 Toledo plants employment show gain over year ago 567
 Wilson foundry reopening 188

Engines—See also Diesel Engines & Aircraft Engines

- Cross rotary-valve engine 661
 Engine roughness? What is 170
 Influence of compression ratio, barometric pressure and temperature on volumetric efficiency 104
 Iron and copper bonded in composite cylinder heads 724
 McKenzie demonstrates 4 cyl. improvements 570
 Measurements show wear uniformly distributed around cyl. bore 86
 Miniature engine for model planes 800
 Nitrided cylinder liners 694

Oil consumption found to increase with detonation	363
Packard 12 manifolding and valve take-up	449
Waukesha offers Hesselman engine for trucks	267
Yellow gets rear engine patent	87

F

Financial News

Allis-Chalmers reports first half profit	134
Auburn 2nd quarter net loss	66
Auburn to offer notes to stockholders	610
Austin sale approved	219
Auto-Lite earnings	617
Auto-Lite reports profit	223
Automobile Finance Co. of Pittsburgh declares dividend	575
Automotive companies register capital issues with SEC	37
Automotive profits surge upward in first half	128
Automotive stocks make gain	477
Bendix dividend, Extra	645
Bohn first half profit	69
Borg-Warner dividend	712
Borg-Warner to redeem preferred shares	340
Briggs earnings	9
Buick net earnings for first half	131
Buick Mfg. \$5,000,000 loan approved	128
Buick Wheel dividend, Extra	545
Buick Wheel first half profit	96
Buick Wheel to pay preferred dividend	709
Chrysler calling second note loan	219
Chrysler Corp. calls third note of loan	568
Chrysler profits up	97
Chrysler 10-yr. income spent for material, Two-thirds of	440
Cleveland Graphite 6 mos. profit	152
Cleveland Tractor plans million debenture issue	675
Continental revising financial setups	133
DuPont to distribute GM stock as dividend	679
Eaton pays extra dividend	434
Faulkner gives Auburn officers stock options	842
First half earnings	164
Fruehauf denies outside interests in company	618
GM doubles regular dividend rate	158
GM earnings reflect increased car demand	574
GM first half earnings	99
GM 1935 stockholders triple '29	353
Governmental loans to industry held inadequate	443
Graham-Paige reports loss	683
Hayes Body reports quarter loss	103
Hoskins declares extra dividend	340
Houdaille-Hershey first half profit	69
Hudson current ratio	342
Hudson has best half in 5 years	129
Hudson 2nd quarter profit exceeds first	65
Hudson starts '36 output	403
Hupp board members; Andrews loses Hupp independent stockholders committee	407
Hupp proxies asked	152
Hupp reports 6 mos. loss	194
Hupp stock proxy comm. declines reply to Andrews	163
Jones & Laughlin plans expansion	331
L-O-F reports net profit	815
Mills assigns shares in Auto Stamping to bank	72
Modern Equipment factory at De-fiance, O.	646
Motor company earnings	100
Motor Products net profit	645
Motor shares lead stock advances	73
Murray bond call planned	535
Murray files data with SEC for new share issue	475
Murray-Ohio plans bond retirement	501
Packard first half profit	385
Packard makes profit in 2nd quarter	99
Parker Rust Proof 6 mos. profit	66
Parker third quarter profit	134
P-A balance sheet	439
Raybestos-Manhattan reports income	152
Reo earnings	227
Reo 3rd quarter profit	127
Reynolds Spring reports profit	505
SEC denies request to delist Hupp stock	227
A. O. Smith common stock now listed on big board	9
Sparks-Withington reports loss	542
Stewart-Warner earnings for 3 mos.	408
Stewart-Warner 6 mos. net profit	8
Stocks, Big board and curb lists drop automotive	103
Studebaker loss, Early new model dates cause	101
Studebaker loss small; working capital increases	618
Sun Oil declares extra dividend	131
Syracuse to foreclose on Franklin for taxes	575
Thompson Prod.-Toledo Steel affiliate; plan new stock issue	703
Timken declares 50c extra	815
Timken reports 6 mos. profit	161

Timken Roller Bearing declares extra dividend	618
United Air Lines Transport reports net income	683
Willys-Morrow auction postponed	348
Willys-Morrow plant sold	545
W-O bondholders get offer	703
Yellow Truck & Coach reports 1st half profit	134
Young first half profit	69

Financing

August new car retail financing up over '34	405
Bank cuts big slice of retail financing business in Calif.; branches permit spreading market	790
CCC rates 6% in several sections now	538
Canadian August retail financing increases	473
Canadian financing increases over year ago, May	38
Counter seasonal change noted in July financing	257
Finance companies urged to prove worth of service	406
Financing-Registration ratio lowest since '28	614
Financing reserves sole profit source for dealer, NADA says	775
GMAC announces finance plan	537
Indiana financing act held invalid	433
Jan.-Oct. wholesale, retail financing tops entire year of '34	781
June retail financing volume gains over '34	96
Low finance rates seen for used cars	839
New car financing	649
October new car financing dollar volume down	710
Reo, Studebaker, announce low rate financing plan	674
September retail financing up	536
Wholesale financing approximates 75% of value of car dealers' new unit purchases	193
Wholesale financing dollar volume up for 9 months over year ago	617
Wholesale financing for 7 months	347
Will survey bank-finance company relationships	163
Wisconsin Senate passes finance company control bill	194

Finishes-Vehicle

Impervious films, New coatings produce	702
Lacquer finish stretches like rubber, New	131
Lithoform makes paint stick to galvanized iron	329
Roxalin has new finishes	329

Foreign Plants

Albion buys Halley plant	747
GM, Holden, Ltd., plans big extension program	571
GM to build assembly plant at Mexico City	442

Foreign Trade

Argentine motor imports 95.8% U. S. manufacture	646
Austin and associates counter British steel price rise with own company	705
British GM unit to share 10% of net	222
British motor exports register big increase	783
British vehicle output	707
Canadian August retail financing increases	473
Canadian dollar volume up in first half	193
Canadian financing increases over year ago, May	38
Canadian gasoline imports show increase	378
Canadian motor plants, Cancellation of concessions on U. S. cars asked by	808
Canadian new car sales up	2
Canada may rescind discount	256
Canadian prices for '36 on 3 GM cars	712
Canadian Trade Treaty little aid to tire companies	711
Champion sales in England on up-trend	470
Chevrolet eliminates errors in packing for export	560
Colombia reduces import duties on cars and trucks	504
Duty reductions small on replacement parts	779
French hn. tax, Removal of	630
Ford of Canada shipping 7 trains of cars abroad	742
Ford V-8 for British, Smaller	471
German Diesel industry, Big export increase aids	70
Graham estimates exports for 1936	435
Japanese motor co. to build 8 cylinder car	705
Makers withhold comment on Japan's control bill	193
Motor industry gains important duty reductions in U.S.-Canada Trade	678
Motor trucks exempt from US embargo list	538
Nash ships cars by boat	441

Netherlands treaty binds duties at present levels	838
Pioneer French car maker reorganized	268
Studebaker Belgian plant in full production swing	707
Studebaker September exports higher	471
U.S.-Canadian pact believed motor aid	641
U.S.-Canada trade treaty	680
Vehicle output boosts Canadian business index	774

Forum

Engine types for rear mounting on passenger cars	235
--	-----

Fuels

Analysis disproves economy of wood gas as motor fuel	253
A.P.I. petroleum reserves estimate proves shortage fears groundless	842
A.P.I. reports retail gas price drops	71
Canadian gasoline imports show increase	378
Contest to promote fuels other than gasoline	112
England makes progress in synthetic gas production	224
Fuel and oil consumption of aircraft	362
Fuel burns with little residue, Report new solid	37
Fuel demand, Gauge December	782
Gas consumption rose, September daily average	740
Gases on explosions, Effects of inert	788
Gasoline substitute use made mandatory in Italy	354
Gasoline volatility, Warming-up quality proposed as index of	50
Germany builds more plants to make gasoline from coal	350
Gasoline consumption up in first 5 mos.	192
Heats of vaporization of gasoline	527
Interstate oil compacts are championed; new fuels and oils presented to A.P.I.	654
Octane, Dr. Graham Edgar hails 100	541
Proposed railroad gas rate cut protested by ATA	348
Saskatchewan to grade gas	332
Survey classifies registered cars by age groups and fuel requirements	728
Taxes raise gasoline in Rome	566
Testing Diesel fuels, New technique and apparatus for	202

G

Gears—See also Transmissions

Dominion Engineering Works to produce cone worm gears	614
Factors influencing durability of spiral-bevel gears for autos	662, 696
Synthane for silent gears	329

Government Agencies—See also NRA Activities

Dealer query on voluntary agreements goes to FTC	1
Eastman to administer Carrier Act under ICC	190
Governmental loan to industry held inadequate	443
ICC Carrier Bureau names 13 key men	472
ICC suspends five more carrier act provisions	440
ICC to hold hearings on New Orleans rail rates	378
Martin succeeds O'Neill as NRA head	256
U. S. plans goods movement survey	191
Wagner labor board, Hunt for personnel held reason for delay in naming	159

I

Ignition—See also Parts, Accessories

Spark-Plug fouling analysis	754
-----------------------------------	-----

Instruments

Abrasiometer measures wear resistance	762
Accelerometer, New Recording	241
Bendix brake press-o-meter	461
Brinell machine, New direct reading	398
Brown air operated controllers, New	217
Checking automobile crankshafts with Arnold gage	303
Contractors, New "line-arc" magnetic Contour-measuring projectors, New	562
Decelerometer, recording	670
Device for laying out, checking and drilling dies, New	307
Dynamometer, Taylor water	562
Gages, G.E. electric thickness	460
G. E. tachometer	60
Measuring 2/1,000,000 of an inch with Johansson gage block	320
Micrometer, Bath internal	306
Readings with dwarf Brinell press, Quick	308
Sperry Adher-O-Scope	702
Tool for the metallurgist, New	498
X-Ray inspection on production line	32

L

Labor Relations—See also Management & Employment

AFL charters new unions	194
AFL lodges discrimination charges against Fruehauf	349

AFL plans new member drive	125
AFL to cooperate with outsiders	737
AFL-Toledo workers' rift revealed by union attorney's suit for fee	739
AFL union at Bendix invokes Wagner Act	249
AFL union workers at City Auto Stamping strike	433
AFL vote to return at Motor Products	681
Age distribution of automotive workers	174
AIWA-MESA strike at Motor Products	673
APEM board recommends liberal labor relations policies to parts makers ..	220
Auto-Lite union workers ask rise, new contract	806
Automotive men sit on Berry's Council	777
Berry outlines conference program ..	740
City Auto Stamping workers end strike ..	470
Cleveland motor workers' delegates confer with Lewis on vertical plan ..	703
Designing engineers seek bargaining agency status	814
Detroit Labor Board organized	406
Dillon gets motor union presidency ..	330
Employment "predominant motive" of road program, Wallace reports	810
Experiment in automotive labor relations—the Automotive Labor Board ..	286
Fairness urged in APEM bulletin on policies under the Wagner Act	158
Fisher guarantees aged workers jobs and wages	739
Fruehauf fights Labor Board rule	807
Fruehauf labor case, Hearings under way on	616
GM gives \$25 to each worker for Christmas	838
Glossary of automotive labor organizations	474
Goodyear labor scrap referees complete quiz	740
Goodyear workers place wage-hour woes before Perkins' fact-finders ..	704
Independent motor unions confer on amalgamation	433
Independent union combine voted at Detroit meeting	840
Independent union wrangle fails to halt merger plans and meeting	809
Industrial union campaign starts Akron workers	745
Industry favors older workers	157
Labor situation production key	703
L-O-F workers negotiate new contract, wage rise	806
L-O-F Union negotiations	843
Lind to head "Toledo Plan" work ..	68
MESA demands recognition wage boost at Mather Co.	643
Mechanization increased Ford employment—Cameron	744
Motor labor earnings rise in 10 mos. ..	507
NLRB establishes 21 regional boards ..	376
NLRB gets United Air labor dispute ..	838
NLRB orders Greyhound cease "labor violations"	776
NLRB to hold Fruehauf labor act hearing	542
Organized labor seen waiting chance to hale motor cases before new NLRB ..	248
Packard employees honored, Long-time Perkins labor policy recommendations ..	808
Perkins' trouble shooters to sift Goodyear wrangle	675
Race for worker membership between AFL and AAWA	345
Rally launches Coughlin plan for new vertical union in automotive industry ..	4
Reo workers average long service records	845
Spicer Co.-MESA sign new contract ..	348
Spicer-Union agree on wage rise, 40-hr. week	255
Straight-time rate prevails in motor industry despite trend to bonus plan ..	69
Thompson piston pin plant, Strike shuts	132
Thompson piston pin strike deadlocked ..	165
Toledo automobile workers union membership up	223
Toledo GM workers seeking jobs for 900 men; charge intimidation	806
Toledo plan operation reduces labor troubles	225
Toledo Unionists ask new charter	773
Workers split on union set-up	247
Workmen's insurance rate increases in Calif.	673

Legislation

Administration, Labor seen uncertain on benefits accruing from labor bill ..	35
Berry repeats bid to NRA conference; Reeves warns against harmful effect ..	538
Business attacks "Share-the-Wealth" bill	165
California, Idaho require permits, fees for caravans	504
Carrier act rate provisions postponed, New	408
Conference tax bill retains unsound graduated levy on corporate incomes ..	221
Eastman Bill now looks sure, Passage of	68
Eastman Bill reported substantially same as Senate measure	102

Eastman measure, Rate control eliminated, route carrier regulation modified in	37
Eastman measure, Subcommittee to report	17
Finance companies aided by bank bill amendments	225
FDR asks Congress to formulate new law on hours, wages, trade practices ..	252
FTC will seek Clayton Act changes to control discounts, allowances	739
Gas tax, one of highest in U. S., to be cut, 9c	225
Graduated excess profit levy proposed in House "Share-the-Wealth" tax bill ..	126
House passes Motor Carrier Bill	132
Industry's role in social security scheme	261
ICC reorganization bill may pass this session	37
Job insurance laws, More	351
Knudsen, McClintock warn against laws impairing car's efficiency, usefulness	500
Madden stresses limitations commerce clause imposes on labor disputes act ..	334
Mexican border residents can buy U. S. cars duty free	413
Mexico plans check on stolen car entry ..	643
Motor carrier bill awaits Roosevelt OK ..	164
NASFC opposes Wisconsin Finance Co. measure	34
Nebraska brake law, New	189
Old age pensions, Job insurance become law as President signs security bill ..	191
President offers industry immunity from Sherman Laws for voluntary codes	434
Proposed NRA legislation	381
Safety glass legislation boosts Pittsburgh's sales	618
Safety glass measure signed in Calif. ..	39
Security Bill delayed by company pension system snarl	69
Selling licenses, 15% maximum finance charge required by Wisconsin sales law	404
Senate gets A. E. of L. backed bill to control business by U. S. licenses ..	196
Senate gets drastically revised tax bill "in conformity" with FDR's message ..	190
Shipper sets rates Eastman tells MTA ..	566
Sloan flays tax proposal	33
Social security taxes not due before 1937	508
Toledo parts manufacturers ask FTC for relief from steel price differentials ..	36
Trust receipts act passed by Illinois ..	477
USCC seeks industry's attitude on legislation	504
Vandenberg denounces tax bill for effect on Ford industries	185
Wagner Labor Act held unconstitutional	379
Wagner Labor Act means to industrial employers. What the	82
Wagner Labor Bill waits President's OK	8

Litigation

Andrews blocks Hupp stockholders meeting	345
Andrews suit, Present Hupp directors upheld in	542
Bendix NLRB case, Legal quibbles mark	809
Chrysler buys license under Jaray streamline patent	98
Court expected to OK more W-O cars ..	103
Creditor would halt Willys-Morrow sale ..	221
Decision defines repair parts makers' rights	102
Federal Court to hear GM suit against Indiana law	410
FTC cites Winslow for unfair practice ..	709
FTC restrains Birmingham jobbers from price fixing	193
Franklin foreclosure waits on title search	805
Fruehauf hearings, NLRB conclude	645
Goodyear denies price discrimination charge	383
Goodyear, Recommend cease-desist order against	815
Goodyear replies to FTC findings in price case	192
Hupp case record, U. S. Court grants plea to alter	72
Hupp directors ask Court record change ..	37
Independent parts maker wins GM patent suit	676
Indiana financing act rule may halt further laws	475
Indiana instalment sale act in U. S. Court, Test	35
Schulman fender patent held invalid by U. S. Court	508
Tariff ruling appealed, Canadian	381
Tennessee jobbers charged with price fixing by FTC	842
Timken seeks stay of ICC freight rate order	193
Tire companies fight proposed tax law ..	746
Traffic League asks ICC to rehear spotting case	504
Universal must drop "Mfg." from name ..	38

Willys, Court approval expected for more	1
Willys gets Court OK to build more cars	129
Willys hearing	101
Willys-Morrow Co. plant auction approval asked	191

Lubrication

Grease consumption for chassis lubrication	788
Hersey lectures at MIT on lubrication mechanics	610
Illinois wholesalers granted engine exchange privilege	472
Oil consumption found to increase with detonation	363
Significance of added agents to motor lubricants questionable, API told	641

M

Machine Tools—See also Shop Equipment, Production Methods

Automatic lathe for high speed quantity production	397
Avey Hydraulic feed unit	401
B & S, Three new machines by	304
Bolt machine, New high production ..	206
Bore-Matics, Two new Heald	401
Borer speeds production, New jig	214
Boring machine speeds production, Single point	292
Broaching machine speeds production ..	309
Bullard multi-au-matic for high-speed work	318
Cam controlled table feed	302
Chamfering machine, High capacity gear tooth	397
Cincinnati unit center type grinder ..	124
Cleveland automatic multiple-spindle machines	322
Control for swivel table grinders	151
Diamond tool boring machine, Vertical ..	532
Dieing machine, 50 ton	308
Drill by Buffalo Forge	319
Drill has speed of 8000 r.p.m.	318
Drill, New high speed radial	299
Finishing machine for internal gears ..	562
Forging crankshafts	294
Gear finishing machine, Single class ..	31
Gear shaper, Fellows No. 6 hour glass ..	401
Generating machine has new features, Gear	304
Gisholt announces three new lathes ..	768
Gorton duplicators, New	399
Gould & Eberhardt introduce 2 new machines	297
Grinder, Abrasive Machine Tool	302
Grinders, Besly double spindle	400
Grinder, Ex-Cell-O precision thread ..	296
Grinder faster, New Blanchard	310
Grinder has hydraulic feed, Large surface	320
Grinder, Heavy-duty surface	317
Grinding machine, Wesson has double end Diamond	312
Grinders, Mattison surface	322
Grinder, New full automatic face mill ..	295
Grinder, New hydraulic surface	300
Grinders, New Norton	300
Grinder with automatic sizing, Hydraulic	298
Grinder with automatic sizing, New Bryant	305
Head has many new machines	298
Hydraulic control added to new Porter-Cable lathe	301
Kent-Owens No. 26 milling machine ..	94
Kingsbury fleximatic	398
Landis hydraulic grinding machines ..	123
Landis model O chaser grinder	63
Lathe, Automatic slide rule on "Hydratrol"	296
Lathe, Center drive crankshaft	241
Lathe, Cromatic 8 spindle automatic ..	400
Lathe for cemented carbide tools, High-speed	316
Lathe, Jones & Lamson turret	314
Lathes, Monarch presents several new ..	311
Lathe, New cutting alloys require new type	294
Lathe, New Gisholt turret	302
Lathe, Rivett open-head	314
Lathe, Seneca Falls speedcut	294
Lathe, W & S universal turret	321
Leland-Gifford Co. exhibits new products	399
Miller for small parts, High-speed ..	312
Miller has directional control, Giddings & Lewis	307
Miller, New tool room	702
Milling machine for laboratory	833
Milling machine for small parts, Production	373
P & J spindle automatic	292
P & S automatic chucking machine ..	93
Planer quickly changed to miller	312
Precision boring machine in 3 models ..	306
Press, Improved Toledo	563
Press, Niagara adds inclinable	562
Producto-Matic miller just announced ..	306
Quick speed changes on Millholland lathe	319
Radial drill, New features on American ..	295
Roto-broach on Bullard contin-u-matic ..	532
Sellers drill grinding machine	401

Single spindle automatic cuts costs ..	292
Swiveling cutterhead on Van Norman universal miller	324
Thread grinder, Tool room	155
Toledo press rated at 800 tons	48

Management	
Electric Auto-Lite centers research for subsidiaries at Toledo plant	632
Overhead, management and modernization	483
Used cars expected to be established by Chevrolet, Separate sales division for	503

Marketing—See also Foreign Trade	
Consumer thinks about new cars, Finding out what the	818
Distribution gets consistent attention, Planning of retail	828
Factory-dealer '36 contracts liberalized, Report	505
Ford puts up \$500,000 in sales prizes; Chevrolet offers dealers cash bonuses	576
Studebaker - Autocar representatives confer on truck merchandising plans	812

Meetings	
Automotive production plays prominent role at metal congress	450
Fuel testing, Diesel costs dominate API-SAE coast meetings	720
Metal congress and show	422
Rust-proofing and welding	432

Metallurgy	
Alloy may be useful in piston construction, New	68
Cadmium cause metal shortage, Bearings of	737
Cerium used in new Ni-Al alloy	206
Copper alloy has unusual properties, New	81
Doehler announces new brass die-casting alloy	379
Durez material, New	214
Durez 5331 material	498
Endurance tests of case-hardened gears show varying load capacities	454
Free-machining alloy steels contain selenium	196
Heat treatment and drying, Automotive plants using induction furnace for	389
J-metal for high speed cutting tools	308
Machining data on Haynes-Stellite J-metal applications at Lycoming	272
Machining or sanding with Durez material	215
Mechanism of chromium deposition from the chromic-acid bath	138
Rustproofing processes for automotive industry	390
Steel plating process allows use of dyes in aluminum coating, New	838
Stripes and patterns available in Acme strip steel	216
Udylite products	771

Motor Boats	
Evans building 150 m.d.h. motor boat	184

Motorcycles	
Indian motorcycle adds 4-cyl. model ...	34

N	
----------	--

NRA Activities—Codes	
Industry turns deaf ear to Berry's 2nd invitation to NRA conference	613
MEMA members 197 to 7 against revival of NRA	673
NRA breaks industrial survey into 4 groups	382
NRA lops 1250 workers from skeletonized staff	807
NRA motor industry study progressing, includes manufacturing, distribution	612

O	
----------	--

Obituaries	
Bean, Ashton G., Heart attack fatal ..	98
Best, Charles E.	845
Bournonville, Eugene	783
Citroen, Andre	1
Coleman, Charles D.	9
Cornack, John D.	742
Eldridge, Ernest A. D.	651
Fahrney, E. Homer	542
Goodman, John	712
Hicks, Frederick W.	681
Hunter, William H.	383
W. R. Hurlburt dies, Hupp sales director	612
Larsen, Harold E.	842
Mahoney, Helen B.	250
Morgana, Charles	195
Myers, Joseph Lawrence	3
Peterson, Walter C.	712
Power, Charles M.	541
Sawyer, Murray Gibson	542
Seitz, Joseph J.	38
Sinyard, James L.	68
Stitt, Harry E.	250
Wells, Lewis	841
Willys' career ends	251
Wolfe, Maurice	839

P	
----------	--

Parts Descriptions—See also Aircraft Parts	
---	--

Alupak cylinder-head gaskets	366
------------------------------------	-----

Bonded rubber-to-metal parts for automobiles, etc.	822
Carter fuel filter, New	191
Chain, Develop new tractor	508
Gabriel-Walex shock absorber	250
LaSalle balancing, Wrist pin lock screws used in	112
Magneto, Series AP Wico	371
Monroe goes to volume production on group of specialized parts	793
New positive displacement supercharger	178
Nitrided cylinder liners	694
Pedrick sealed-channel compression ring	460
Permite bimetallic exhaust valve	276
Screws, Fibro-forged	31
Valve, Thompson aertype	833
Watson co-dampers give smoother ride	803

Personal Notes

Aherns succeeds Chick as Cadillac sales mgr.	673
Allredge promoted by Thompson	780
Babcock heads Yellow	219
Bondesen promoted by AC	545
Bowers joins Young	642
Butler promoted by Chevrolet	133
Caldwell appointed to Calumet Steel Co.	158
Carbondale announces officers, directors	412
Carpenter joins Republic	347
Cedarleaf leaves GM	411
Chevrolet moves Addison	505
Christopher heads Packard production	127
Cochrane joins Casco	162
Cooper succeeds Hicks	781
Curtis with F-S Steel	473
Denham joins Schipper	96
Denyes joins Gemmer	474
Distler promoted by Republic	443
Dunlap joins advertising agency	349
Fisher joins Republic	439
Fitzpatrick joins Algoma	253
Glancy gets State post	3
GM truck, Officer personnel changes announced by	773
Harding named to Toledo Industrial Peace Board	536
Harding promoted by Auburn	503
Harrison quits Commerce Department machinery post	225
Heroux to manage Permite paint sales	379
Hewins transferred by Studebaker	545
Hudson promotes, Byrne, Powers, Turill, Hadley	249
Hunsaker joins United	160
Hupp names officials	152
Hurlburt to head Hupp sales; Clarke aide	2
Keller is Chrysler president	95
Kishline named Graham-Paige chief engr.	160
LeWald appointed	224
Lichter to supervise Hupp body division	253
Liebach transferred to Detroit area	443
Macauley hurt when car collides with truck	473
Martin succeeds O'Neill as NRA head	256
McCormick, H. F., named Harvester chairman	409
MacDonald to head Hupp sales; get new capital	612
McDuffee president of Prest-O-Lite ..	34
McKinstry heads Harvester executive committee	543
Neeley in new post	782
Pickell with Chris-Craft	131
Potter elected Shuler president	256
Retzlaff rejoins Fruehauf	619
Roberts leaves Packard, to retire	68
Roberts and Geffs join Four Wheel Drive staff	223
Rogers heads new motor carrier bureau under ICC	221
J. D. Swain promoted	470
Tapscott NIAA director	508
Thermoid assigns Ross, Allen to Detroit office	7
Voigt promoted by Graham-Paige	160
Webb joins Check-Chart	384
Williams president of Mitchell Specialty	93
Williams promoted by Timken	6
Williams to head Brake Lining Assn.	442
G. R. Woods appointment	782
Worden heads Pontiac's mass selling department	353

Pistons

Aluminum pistons forecast, More widespread use of	257
Piston ring, New Pedrick	329

Plants—Changes, New and Expansion—See also Production Methods

AC Spark Plug expansion completed ..	343
Air Reduction builds Chicago plant ..	355
Allis Chalmers to make improvements ..	376
Bantam moving into new quarters	220
Bohn to enlarge plant	134
Boiler at Ford plant delivers steam at 90 deg. F., new	225
Buick's revamping program for '36 nearing completion	197
Champion Spark Plug to enlarge Toledo plant	644

Chevrolet expansion program, Details of	540
Chrysler Canadian plant addition	188
Chrysler enlarges Detroit storage, shipping facility	410
Clark Co. alters plants to expedite truck job	69
Delco to establish East Coast battery factory	227
Eaton enlarges plants	224
Edelmann enlarges plant	97
Evans Products add to Detroit plant ..	508
Fisher and Chevrolet expansion at Tarrytown	340
Fisher body plant, Plan Grand Rapids ..	805
Fisher Body purchases Murray Wood Tenn. plant	103
Ford of Canada to build Wellington, N. Z. plant	746
Ford to build valve factory at Northville	130
Forstoria, York merge fender operations ..	184
Fox buys new plant	100
Gauder, Paeschke & Frey adding building	160
GM building gas plant	377
GM leases DeVaux-Hall plant for storage	331
GM to expand and improve productive facilities	189
GM to spend money on equipment at Oshawa plant	191
Harris builds plant	192
Harvester buys 42-acres for plant expansion	6
Harvester plant begun, New	705
Harvester to expand Springfield factory ..	103
Harvester to modernize steel plant in Chicago	503
Harvester to spend million revamping E. Moline plant	224
Hercules establishing factory at Muskegon	610
Hudson installs new giant presses for roof panels	384
Jones & Laughlin plan expansion	815
Kelsey-Hayes building new foundry in Detroit	126
L-O-F new plant addition to facilitate production	6
Link-Belt to move	642
Macklin adds 50% to capacity	197
Michigan Tool expands	747
Modern Equipment factory at Defiance, Ohio	100
Nagle & Sons acquires larger Toledo plant	197
Packard expanding output facilities	73
Plymouth plans 4 additions to plant	129
Plymouth to build 4 Detroit plant additions	8
Pontiac revamps iron foundry for reopening	383
Rebuilt Fisher plant at Pontiac in operation	334
Reynolds Spring to open Detroit plant ..	344
Ryerson plant addition completed in Jersey City	505
Scintilla enlarges plant	194
Studebaker plans West Coast assembly plant	247
Victor enlarges plant for gasket production	377
Wills-St. Claire Marysville plant bought Chrysler	227
Young Corp. completes new Chicago factory	350
Zenith adds to plant	225

Prices, Changes

Auburn 1936 prices	616
Buick to lower '36 prices	375
Cadillac and LaSalle prices	440
Canadian prices for '36 on 3 GM cars ..	712
Chevrolet lowers prices on 3 master deluxe models	573
Chrysler Canadian prices	810
Chrysler 1936 new car prices	611
Competitive price range of '36 coupe, 2-door, 4-door models	651
Cord 1936 prices	616
DeSoto 1936 prices	576
Dodge 1936 prices	619
Ford raises prices on six new models	506
Graham 1936 prices	613
Hudson Canadian prices	810
Hudson 1936 prices	576
LaFayette prices, 1936	576
LaFayette price range, 6 body styles ..	1
Lincoln "Zephyr" prices	568
Nash prices, 1936	576
Packard prices for 1936	407
Pierce-Arrow 1936 new car prices	611
Plymouth 1936 prices	543
Pontiac 1936 prices	537
Reo 1936 prices	612
Studebaker Canadian prices	810
Studebaker 1936 prices	612
W-O 1936 prices	613

Production, Vehicles—See also Business Conditions

August estimated production	125
Buick boosts '36 production schedule ..	348
Buick new car orders	437

Capacity output salutes show	565
Car makers tapering off rapidly	157
Chevrolet aims for deliveries during August	190
Chevrolet dealers sure of '36 stocks	543
Early shut-downs for new model plan adversely affects GM September sales	469
Estimate 984,000 units in last quarter	641
First half output up over '34	33
First half production	95
Ford's sales in first half	67
Forecast for 1935	345
GM August sales	346
GM June sales gain over May	34
GM October sales set record	645
GM's show month sales top records of all previous Januarys, Novembers	783
GM 10 months German sales up	675
Hall Lamp sales for 8 months	475
Holiday let-down curtails output	837
Hudson's initial 1936 car orders, 25,000	434
July car, truck output	248
Medium priced classes lead gains	845
New model output swings up	375
1936 production schedules	467
November output beats all initial months	773
October output	609
October output estimated	467
Oldsmobile 1935 output	379
Oldsmobile 1935 output	435
Operations on Willys cars begin	251
Output for nine months tops '34	467
Output passes 3 million mark	403
Packard estimated car production in '36	407
Packard's schedule biggest in history	437
Plant changeovers under way	187
Plymouth estimated yearly production; new models Oct. 26	437
Pontiac schedules for '36	468
World production of motor vehicles	571

Production Methods—See also Welding, Cutting

Broader adaptability feature of new machine tools	282
Buick revamps engine div. for '36 output	356
Buick spends millions for modernization	278
Bumper production	149
Case-hardening and heat treating, New method of	370
"Cone" gearing, New Equipment developed for production of	243
Dodge truck plant daily capacity, Modernized	228
Electro-dynamic balancing equipment suited to use in automotive production	394
Equipment in Buick Foundry improves quantity, quality and working conditions, New	76
Ford adopts single point boring	110
Ford blast furnaces now produce 1600 tons daily	191
Heat treatment and drying, Automotive plants using induction furnace for	383
Highlights of 1936 production developments	634
Lamps finding increasing use in automotive plants, High intensity mercury	114
Packard has installed completely mechanized heat treating units	761
Parts makers must modernize to keep pace	280
Pontiac's new rust-proofing process handles parts for 90 cars per hr.	473
Resistance welding finds usefulness broadening in motor vehicle plants	386
Rubber's automotive usefulness, Research steadily broadening	368
Rustproofing processes for automotive industry	390
Surfaces charted by J. E. Kline, Desirable characteristics of	796
Ternstedt production highspots	42
Transmission gears at Buick	10

R

Registrations, Motor Vehicles—See also Aviation, Motor Boats, Motorcycles	
Vehicles are 7 or more years old, One-third of	57
Vehicle registration rises; N. Y. leads states	782
Roads	
Coast-to-coast road urged	125
Selective lighting of highways would save many lives, NELA study indicates	786
Super-highways by-passing cities are urged	18
Rubber	
Crude rubber import up over year ago, November	815
Mold found at Goodrich Co., Historic rubber	814
Plymouth cars, More than 400 rubber parts feature new	502
Rubber covering, New	94

S

Safety, Vehicle—See also Legislation

Accident problem, N. Y. tackles car	774
ASA poll under way on inspection standardization	351
Casualty Bureau planning safety standards meeting	744
Deaths lower, Motor accident	6
Industry battles dumb driving on broad front	198
Kelly to propose 4-way safety plan	743
Safety effort, Praise, criticism for	805

Safety, Industrial

Chevrolet forge plant wins safety trophy	408
--	-----

Sales—See also Marketing, Registrations

August sales estimate	219
Canadian new car sales up	2
Car and truck sales up 1st half of '35	140
Cars in lower price brackets show biggest dollar volume increases	743
Car, truck sales up	254
Chevrolet's August drive	382
Commercial car registrations by states 1st 6 mos. '35 and '34 compared	207
First half totals surpass even most optimistic expectations	166
January-August new car sales above '34 period	405
January-July dollar volume reflects year's general uptrend	350
June ends in big sales spurt	1
July opens strong despite 4th	33
July sales for U. S.	65
Mack truck awarded NYC order	544
New car registrations	236
New car registrations up in November—double last year's figures	840
New truck registrations	336
November sales set new record	737
October new car sales	704
Registration gain for 10 months—Packard, DeSoto, LaSalle lead	742
Retail sales decline as new session nears	247
Sales for summer firm	95
Sales of "lower bracket" cars in September tops same month's sales in 1934 by 12 million dollars	620
Thermoid sales gain	380
Truck sales swinging upward	330
U. S. War Dept. orders 74 trucks from Federal	544

Shop Equipment—See also Machine Tools, Welding & Cutting

Air compressors, Two-stage	293
Allis-Chalmers extends line	563
All-steel die sets produced by Danly methods	93
Automatic control for gas furnace	563
Belts for machine tool drives, Oil proof vee	309
Belt lacer	301
Bendix Products low-priced "inspection line"	214
Cable connector, Quick detachable	804
Carboloy wheel dresser, New	803
Chuck, Swivelling magnetic	293
Cleaning parts in process	303
Clutch, A new sleeve type	155
Clutch, New features in magnetic	156
Continental sawing and filing machine	640
Controller, Tag No. 40	496
Degreasers, Cleaning parts with Blakeslee	311
Die casting machine, Full hydraulic	214
Die-filing machine	316
Drill grinder, Floor stand	215
Drilling unit, Improvements in Mill-holland	833
Electric furnace, has controlled atmosphere	398
Enameling small parts by centrifugal pressure	316
Extinguisher, New Pyrene pressure	371
Farral lubricating system	297
Ferritrol inhibitor for pickling	638
Filters for coolants and cutting oils	321
Filter quickly cleaned, Acid	532
Forging machine with cushioned drive Gears with improved gear finishers, Quileter	326
General Electric new products	532
Greenlee hydraulic unit	401
Hammers, Alliance steam	322
Hanna press for spring shackle bushings	460
Hannifin air operated moulding press	155
Hannifin sensitive straightening press	151
Honing machine has mechanical drive	313
Hydraulic ram feed on heavy duty drill "Hydraumatic" control for Reeves transmissions	301
"Hylift" truck, Five ton	295
Ingersoll Zee lock side milling cutters	32
Johns-Manville markets tru-check brake tester	184
King pin TestABrak	214
Lammert control valve	462
Lathe, Cincinnati tool room	323
Lathe, New precision tool room	398
Link-Belt Shafer roller bearings	639
Lovejoy flexible coupling	63
Machine handles sheet stock in coils	324

Madison-Kipp presents new die-casting machine

Marquette diesinking profiling pantograph	299
Mixing valve for uniform flow, New	60
Motors, New Century electric	311
Oxweld acetylene generator	670
Pillow blocks, Ahlberg has developed line of	307
Plating machine, Semi-automatic	833
Plating unit, Low cost	156
Press, New Cleveland trimming	318
Press, New features on hydraulic	310
Power press run from elec. light socket	210
Power unit, New Stow	372
P & W tilting rotary table	372
Press, Hydraulic forcing	305
Press, Motor driven arbor	295
Press, V & O high-speed notching	320
Pump, Self-priming centrifugal	308
Rex degreasing machine uses "Perma-a-clor" solvent	400
Riveter, Light weight feature of Hannifin portable	306
Safety device for punch presses	372
Schrader quick acting couplers	276
Shear speeds production, New Cincinnati	297
Taps, Extension link for collapsible	94
Temperature limit control	638
Texrope drive shown by Allis-Chalmers	311
Threading machine, Geometric	309
Threading machine has hydraulic control, New Lanhydro	318
Time meter, New total	124
Toledo scales	301
Tomkins-Johnson clinchor	670
Valve stem heater, Berwick electric	31
Vickers hydraulic variable-speed transmission	123
Westinghouse contactors for machine tools	317
Work aligning and indexing fixture	638
Work automatically clamped on Niagara shears	325
Yale "Pul-Lift"	298

Shows

ASI show space nearly sold out	159
Auburn at Buenos Aires show, Three prizes for	775
Automotive display at Texas Centennial Show	6
British models reveal no fundamental changes in '36	409
Canadian Show to reveal new vehicle brake system	134
Car makers select space at N. Y. Show	128
Chicago values '35 show at 3 million	567
Foreign list gives ASI show cosmopolitan air	683
Machine tool building, Great modern spectacle dramatizes art and progress in	377
Machine Tool Show of 1935 mirrors industrial progress	349
New York Show has "largest retail selling since 1929"	646
Paris show reveals trend toward full width bodies without running boards	520
Payload-chassis ratio and oil engine for heavier trucks lead trends at London Show, Better	716
Planes to feature aircraft show, Sports, business	72
Sales brisk at "experimental show," fall date may be permanent	609
Setting stage for World's biggest and most instructive machine tool show	75
Showmanship makes Chicago Show year's biggest event	677
Show start of cooperative employment experiment	405
SAE production activity program in conjunction with Machine Tool Show	73
Streamlining and high-performance cars dominate the new models at Olympia show	624

Spark Plugs

AC develops spark plug for radio equipped cars	72
AC spark plug with built-in resistor	216

Standardization

Approves iron, steel scrap simplified practice plan	471
ASA approves standard sizes of jig bushings	68
Drafting standard, New	66
Electrical units endorsed by International Congress, New System of	260
Leaf spring plates proposed by Chrysler, New standardized specifications for	76
SAE defines front wheel alignment terms	338
SAE revising Nebraska Universal tractor test code	737
Standardization of car service points lists 14 objectives, Recommended	798

Suspension—Wheel Spring

Air springs used in new independent suspension	148
Leaf spring plates proposed by Chrysler, New standardized specifications for	76

Studebaker experimental riding quality studies	22
Variable rate spring provided by new torsion bar suspension using rigid axles	54
T	
Taxes	
Automobile license rates cut by Ill.	34
Diesel fuel taxable in 30 states	426
Graduated income taxes, Effects of ...	39
July's Federal tax bill cost to motorists	380
Kentucky gasoline tax collections	841
States' gasoline taxes estimated total ..	309
Steel companies' tax bill in 6 yrs.	73
Testing—See also Production Methods	
Endurance tests of case-hardened gears show varying load capacities	454
Gear inspection, Special appliances used for	88
Tires	
August Tire shipments above last year ..	544
Casing shipments decline, May pneumatic	101
Estimate 500,000 tires rebuilt, retreaded yearly	354
General's new "Dual 10"	683
Goodrich Co. issues tire equipment specifications	809
June pneumatic casings	224
New tire for farm service developed by Goodrich	354
Overloading of truck tires	530
Rim inspections gain	192
Tools, Portable, Small—See also Shop Equipment	
Blades for boring tools, Renewable....	772
Buckeye electric screwdriver	63
Cemented carbide tools for high speed cutting	308
Cutters, New high speed die sinking ...	217
Cutting tools, High speeds and heavy cuts with new	309
Cutting tools, New high-speed	310
Dalrae speedmill attachment	322
Drill and sander by Black & Decker ...	311
Drill, Fosdick	325
Drill, Light weight Thor	311
Electric tools speed production, High-cycle	325
Grinding wheels for every purpose ...	320

H & G dies of new design	299
Hand-ee grinder	32
Improvements made in cutting tools ..	319
Ingersoll-Rand Pott impact wrench ...	62
Ingersoll Zee lock end mills	215
"Mitco Pin Splice" tools	803
Trimson portable surfacer	62
Reamer with serrated blades	372
Tapper used for external threading, Haskins	313
Threading-tool holder	312
Unishear, New portable	462
Universal electric tools	639
Tractors	
Row crop tractor features streamlines, new engine	411
Tractor industry climbs toward renewed prosperity	852
Transmissions—See also Gears	
Automatic transmissions must leave driver some control	15
Automatic transmission, The Eclipse controlled	90
Clutch actuator takes place of the release bearing, New	496
Cord has Bendix vacuum gear shift in new front drive	629
Design trends stimulate interest in powerplant-drive units—Parts 1 to 5 inc. pp. 233, 264, 456, 489, 522	
Differential speed changer must have feed back for inverse torque variation	834
Four-Speed-constant-mesh transmission with direct drive in fourth recommended for lower operating cost	750
Gears for tractors, Low carbon case-hardened	529
Transmission gears at Buick	10
Transmission gears, Quiet	390
Transmission, Heavy duty	276
Transmissions, The design of present-day automobile	528
Truck Descriptions	
Autocar enters 4-wheel-drive field	355
Diamond T new propeller shaft intermediate bearing on rubber	764
Differential, New substitute for the ...	459
Dodge 3-ton trucks	8
Ford of Canada '36 trucks feature chassis refinements	545
International uses 2-speed axle on 3 new truck models	862

Link Belt transmission	460
Macks feature "roll-out" power, New traffic type	144
Marmon-Herrington converts Ford truck chassis to all-wheel drive	100
Reo, new half-ton	257
Tanker capacity, Largest road	71
Tank combination, capacity and weight ..	145
White truck streamlined	365

U

Used Cars—See also Marketing, Financing, Foreign Trade	
British used car price book to appear Sept. 1	226
Chevrolet used car adv. boosts dealer's sales	405
Knudsen says used car problem worst ..	840
National media back used car sales plan	807
Used-car flood worries dealers	837
Used car guide proposal, Majority of makers give conditional OK to NADA ..	650
Used car stocks near '29 level	805
Vehicles are 7 or more years old, One-third of	57

W

Welding & Cutting	
Acetylene welders	686
Aluminum alloy developed, New process for welding	354
AC welder announced by Lincoln	373
Arc welder for light gage metal, New Ford plant, Welding at the	269
General duty welding torch	460
Lincoln welder, New 200 amp.	671
Linde announces stainless welding rod ..	385
New heavy duty welders announced ..	310
Renew brake drums by welding with bronze	374
Resistance welding finds usefulness broadening in motor vehicle plants ..	386
Seam welder produces 30 ft. of fuel feed tubing per minute	660
Stelco welding tips	372
Welco welding timer	763
Welder and trimmer for flexible shafts ..	323
Welder control, New simple spot	216
Welding torch, New general duty	156

Wheels

Rim inspections gain	646
September rim inspections up.....	504

Index of AUTHORS Contributing to Automotive Industries

J. O. Almen	A
Factors influencing durability of spiral-bevel gears for autos	662, 696
Aske, Irving E. —Iron and copper bonded in composite cylinder heads	724
Baker, J. G. —Electro-dynamic balancing equipment suited to use in automotive production	394
Blanchard, Don	
Buick's 1936 line—prices	416
Cadillac offers smaller 8 for '36	478
Dealers (average 359 NADA members) lose \$14.76 per new car.....	127
Distribution gets consistent attention, Planning of retail	282
First half totals surpass even most optimistic expectations	166
Industry's role in social security scheme	261
Net worth of 16 car makers reduced in depression years	53
New lines and more branches help NSPA jobbers expand sales in '34 ...	213
Biggar, P. E.	
New positive displacement supercharger	178
Bourdon, M. W.	
British models reveal no fundamental changes in '36	409
Payload-chassis ratio and oil engine for heavier trucks lead trends at London Show, Better	716
Streamlining and high-performance cars dominate the new models at Olympia show	624
Carlton, C. C. —Parts makers must modernize to keep pace	280
Chase, Julian —Sharing of income, Mechanization's aid in	46

Christopher, George T. —Overhead, management and modernization	483
Clayden, A. Ludlow —Fuel testing, diesel costs dominate API-SAE coast meetings	720
Curtice, Harlow H. —Buick spends millions for modernization	278
DeJuhasz, K. J. —Measuring the scavenging efficiency of 2-stroke diesels ...	858
Denham, Athel F.	
Automotive production plays prominent role at metal congress	450
Design trends stimulate interest in powerplant-drive units	522
Dubois, Ralph N. —Accelerometer, New recording	241
Geschelin, Joseph	
Accents on safety cover many points in '36 automobiles	848
Bonded rubber-to-metal parts for automobiles, etc.	822
Buick revamps engine div. for '36 output	356
Chrysler models for '36 have longer, stronger bodies, Four	554
Diesel fuel taxable in 30 states	426
Dodge truck plant daily capacity, Modernized	228
Ford adopts single point boring	110
Four-speed-constant-mesh transmission with direct drive in fourth recommended for lower operating cost	750
Highlights of 1936 production developments	634
Leaf spring plates proposed by Chrysler, New standardized specifications for	76
Machine tool building, Great modern spectacle dramatizes art and progress in	377
Machine Tool Show of 1935 mirrors industrial progress	349

McCord bus air-conditioning system ..	258
Pontiac line, Nineteen body styles on three models make up new	516
Selective lighting of highways would save many lives, NELA study indicates	786
Setting stage for World's biggest and most instructive machine tool show ..	75
Studebaker six and eight for '36	586
Gronseth, Harold	
August sales estimate	219
Capacity output salutes show	565
Car demand taxes plant capacities ..	673
Confidence rises as shows approach ...	535
Early plates would aid new car sale ...	433
Estimate 984,000 units in last quarter ..	641
Forecast for 1935	345
Industry battles dumb driving on broad front	198
July opens strong despite 4th	33
July sales for U.S.	65
June ends in big sales spurt	1
New model orders near record	499
New model output swings up	375
November output beats all initial months	773
October output estimated	467
100 million automotive dollars for capital goods in '35	284
Output passes 3 million mark	403
Plant changeovers under way	187
Sales brisk at "experimental show", Fall date may be permanent	609
Truck sales swinging upward	330
Workers split on union set-up	247
R. E. W. Harrison	
Low cost prosperity	446
Heldt, P. M.	
Power-drive units, Design trends stimulate interest in—Parts 1 to 4 incl., pp. 233, 264, 456, 489 (Part 5—See Denham) p. 522	
Engine roughness? What is	170
Measurements show wear uniformly distributed around cylinder bore	86
Rear and under-chassis engines increasingly popular in bus field	120

- Tractor industry climbs toward renewed prosperity 852
 Willys' career ends 251
- Hetzel, T. B.—Testing Diesel fuels, New technique and apparatus for 202
- Hibbert, G. W.—Toledo unionists ask new charter 774
- Hosking, Herbert T.—Sales brisk at "experimental show", Fall date may be permanent 609
- J**
- Jacobs, Fred B.—Gear inspection, Special appliances used for 88
- Mac**
- MacGowan, Thomas G.—Consumer thinks about new cars, Finding out what the 818
- M**
- Mitchell, William—Mitchell charges incompetency hampers aeronautical advances 738

- Moffett, L. W.—U. S. Air Corps looks to Congress for grant to continue procurement plan 738
- Morrison, J. D.—Rubber's automotive usefulness, Research steadily broadening 368
- Musselman, C. A.—What has the future for the youth of America? 49
- N**
- Nealey, J. B.—Bumper production 149
- P**
- Parkinson, John S.—Automobile quieting 209, 429
- R**
- Rabazzana, Hector—Spark-plug fouling analysis 754
- Rushing, F. C.—Electro-dynamic balancing equipment suited to use in automotive production 395

- S**
- Schweitzer, Dr. P. H.—Diesel fuel pumps with declining delivery-speed characteristic best in vehicle service 136
 Testing diesel fuels, New technique and apparatus for 202
- Stillwell, C. J.—Broader adaptability feature of new machine tools 282
- U**
- Utley, S. Wells—Employers show leadership to labor, New crisis demands 830
- V**
- Vane, C. A.—Bank cuts big slice of retail financing business in Calif.; branches permit spreading market 790
- W**
- Waddell, A. F.—Tractor industry climbs toward renewed prosperity 852
- Wilson, S. Davis—Buses will inevitably replace street cars by public demand 826
- Wolman, Dr. Leo—Experiment in automotive labor relations 286

Index of COMPANIES Mentioned in Automotive Industries

- A**
- Abrasive Machine Tool Co.—Grinder, Abrasive Machine Tool 302
- AC Spark Plug Co.—AC develops spark plug for radio equipped cars 72
 AC Spark Plug expansion completed 343
 AC spark plug with built-in resistor 216
- Acme Machine Products Co.—Pump, Self-priming centrifugal 308
- Acme Machinery Co.—Forging machine with cushioned drive 317
- Acme Steel Co.—Stripes and patterns available in Acme strip steel 216
- R. P. Adams Co.—Filter quickly cleaned, Acid 532
- Adrian X-Ray Mfg. Co.—X-Ray inspection on production line 32
- Ahlberg Bearing Co.—Pillow blocks, Ahlberg has developed line of 307
- Air Reduction Co., Inc.—Air Reduction builds Chicago plant 355
- Alcote, Inc.—Abrasimeter measures wear resistance 762
- Allbestos Corp.—King pin TestABrak 214
- Allen Industries, Inc.—Stockholders special meeting 815
- Alliance Machine Co.—Hammers, Alliance steam 322
- Allis-Chalmers Mfg. Co.—Allis-Chalmers extends line 563
 Allis-Chalmers line of sheaves—correction 702
 Allis-Chalmers reports first half profit 134
 Allis-Chalmers to make improvements 376
 Texrope drive shown by Allis-Chalmers 311
- Allison Engineering Co.—GM's Allison div. to build aircraft engines in new plant 98
- Aluminum Industries, Inc.—Aluminum Industries buys Dall Mfg. Co. 675
 Permite bimetallic exhaust valve 276
- American Austin Car Co.—Austin sale approved 219
- American Broach & Machine Co.—Broaching machine speeds production 309
- American Car & Foundry Co.—Valve stem heater, Berwick electric 31
- American Chain Co.—Chain, Develop new tractor 508
- American Chemical Paint Co.—Lithoform makes paint stick to galvanized iron 329
- American Cyanamid & Chemical Corp.—Case-hardening and heat treating, New method 370
- American Screw Co.—Recessed head replaces screw slot 638
- American Tool Works Co.—Radial drill, New features on American 293
- Auburn Automobile Co.—Auburn at Buenos Aires show, Three prizes for Auburn funeral car, New 775
 Auburn line of limousine-type bus 133
 Auburn 1936 prices 440
 Auburn 1936 prices 616
 Auburn 2nd quarter net loss 66
 Auburn to offer notes to stockholders 610
 Faulkner gives Auburn officers stock options 842
 Jenkins smashes 70 marks in Auburn stock car test 67
- Autocar Co.—Autocar enters 4-wheel-drive field 355
- Automatic Machine Co.—Diamond tool boring machine, Vertical 532
- Automatic Products Corp.—Automatic Products buys Aeriet Air Conditioning 101
- Auto Stamping Co.—Mills assigns shares in Auto Stamping to bank 646
- Avey Drilling Machine Co.—Avey hydraulic feed unit 401
- B**
- Bakelite Corp.—Bakelite material, New 342
- Baker Brothers, Inc.—Craftsmaster drilling and boring machine, etc. 327
- Baker-Raulang Co.—"Hylift" truck, Five ton 295
- Bantam Ball Bearing Co.—Ball thrust bearing of unusual diameter 156
 Bantam moving into new quarters 220
 Torrington-Bantam merger announced 410
- Barber-Colman Co.—Hobbing machine, Barber-Colman 324
- Barnes Co., W. F. & John—Boring machine speeds production, Single point 292
- Barnes Drill Co.—Hydraulic ram feed on heavy duty drill 302
- Leon J. Barrett Co.—Enameling small parts by centrifugal pressure 316
- Bartlett Co., Edwin E.—Press, Motor driven arbor 295
- John Bath & Co., Inc.—Micrometer, Bath internal 306
- Bausch & Lomb Optical Co.—Contour-measuring projectors, New 307
 Tool for the metallurgist, New 498
- Bendix Aviation Corp.—Bendix dividend, Extra 645
- Bendix Products Corp.—Bendix brake press-o-meter 461
 Bendix-Products low-priced "inspection line" 214
 Recording decelerometer 670
- Bendix-Westinghouse Automotive Air Brake Co.—Bendix-Westinghouse air-brake equipment 328
- Besly & Co., Charles H.—Grinders, Besly double spindle 400
- Black & Decker Mfg. Co.—Drill and sander by Black & Decker 311
- G. S. Blakeslee & Co.—Degreasers, Cleaning parts with Blakeslee 311
- Blanchard Machine Co.—Grinder faster, New Blanchard 310
- Bohn Aluminum & Brass Corp.—Bohn first half profit 69
 Bohn would buy all Bonneville dam power 125
- Borg-Warner Corp.—Borg-Warner dividend 712
 Borg-Warner to redeem preferred shares 346
- Boston Woven Hose & Rubber Co.—Uniform vulcanization 327
- Bower Roller Bearing Co.—Bower Bearing operations raised by new car needs 475
- Bridgeport Safety Emery Wheel Co., Inc.—Grinder, Heavy-duty surface 317
- Briggs Mfg. Co.—Briggs declared extra dividend 843
 Briggs earnings 9
 Tjaarda rear engine car 502
- Bristol Co.—Automatic control for gas furnace 563
- Brown Instrument Co.—Brown air-operated controllers, New 217
- Brown & Sharpe Mfg. Co.—B & S, Three new machines by 304
- Bryant Chucking Grinder Co.—Grinder with automatic sizing, New Bryant 305
- Buckeye Bumper Co.—Buckeye Bumpers name of Auto-Lite's new company 544
- Buckeye Portable Tool Co.—Buckeye electric screwdriver 63
 Drill, High frequency electric 321
- Bucyrus-Erie Co.—Loadmaster handles up to 7 tons, New 77
- Budd, Edward G. Mfg. Co.—Budd develops new all-steel body 557
 Budd develops new all-steel body construction 757

Budd employing largest total of men since '33	545
Budd Mfg. \$5,000,000 loan approved ..	128
Budd net earnings for first half	131
Self-propelled high-speed train built by Budd	477
Budd Wheel Co.—Budd Wheel first half profit	96
Budd Wheel to pay preferred dividend ..	709
Buffalo Forge Co.—Drill by Buffalo Forge ..	319
Buick Motor Car Co.—Buick new car orders	437
Buick's 1936 line—prices	416
Buick's revamping program for '36 nearing completion	197
Buick revamps engine div. for '36 output	356
Buick speeds new model output	380
Buick spends millions for modernization	278
Buick to broadcast Baer-Louis fight ..	347
Buick to lower '36 prices	375
Buick workers average employment in '35	332
Equipment in Buick Foundry improves quantity, quality and working conditions, New	78
Spr-bonderizing process installed at Buick	226
Transmission gears at Buick	10

Bullard Co.—Bullard multi-au-matic for high-speed work	318
Roto-broach on Bullard contin-u-matic ..	532
Burgess Battery Co.—Burgess develops acoustic treatment for heat, noise ..	378

C

Cadillac Motor Car Co.—Cadillac offers smaller 8 for '36	478
Cadillac-LaSalle advance orders	501
LaSalle balancing, Wrist pin lock screws used in	112
Carboloy Co., Inc.—Carboloy wheel dresser, New	803
Cemented carbide tools for high speed cutting	308
Carbondale Machine Corp.—Carbondale announces officers, directors	412
Carborundum Co.—Carborundum acquires Hutto	133
Grinding wheels for every purpose ..	320
Carpenter Steel Co.—Free-machining alloy steels contain selenium	196
Matched set method of selecting proper tool steels	326
J. M. Carpenter Tap & Die Div.—Super-crest tap	327
Carrier-Engineering Corp.—Air-conditioning system now available for motor vehicles	605
Houde-Carrier air-conditioning system ..	732
Carter Carburetor Corp.—Carter fuel filter, New	191
C. A. V.-Bosch, Ltd.—Alkaline type battery, New	734
Century Electric Co.—Motors, New Century electric	311
Chain Belt Co.—Nozzle, Rex spray	321
Chambersburg Engineering Co.—Forging crankshafts	291
Champion Spark Plug Co.—Champion sales in England on up-trend	470
Champion Spark Plug to enlarge Toledo plant	644
Chandler-Groves Co.—Carburetor, New type	771
Chevrolet Motor Car Co.—Chevrolet adopts hydraulic brake and improves cooling system	580
Chevrolet adopts new rustproofing process	251
Chevrolet aims for deliveries during August	190
Chevrolet's August drive	382
Chevrolet dealers sure of '36 stocks ..	543
Chevrolet eliminated errors in packing for export	561
Chevrolet expansion program, Details of	540
Chevrolet Forge plant wins safety trophy	408
Chevrolet gas economy run	340
Chevrolet increases output capacities ..	499
Chevrolet lowers prices on 3 master deluxe models	573
Chevrolet will introduce new models at show	501

Used cars expected to be established by Chevrolet, Separate sales division for	503
Chicago Belting Co.—Leathers used in belts	326
Chicago Pneumatic Tool Co.—Universal electric tools	639
Chicago Wheel & Mfg. Co.—Hand-ee grinder	32, 327
Chrysler Corp.—Chrysler buys license under Jaray	98
Chrysler calling second note loan	219
Chrysler Corp. calls third note of loan ..	568
Chrysler enlarges Detroit storage, shipping facility	410
Chrysler models for '36 have longer, stronger bodies, Four	554
Chrysler 1936 new car prices	611
Chrysler profits up	97
Chrysler 10-yr. income spent for material, Two-thirds of	440
DeSoto 1936 prices	576
DeSoto '36 restyles airstream and airflow models	598
Keller is Chrysler president	95
Leaf spring plates proposed by Chrysler, New standardized specifications for	76
Plymouth develops generator output control	98
Wills-St. Claire Marysville plant bought Chrysler	227
Chrysler Corp. of Canada, Ltd.—Chrysler Canadian plant addition	188
Cimatool Co.—Chamfering machine, High capacity gear tooth	397
Precision boring machine in 3 models ..	306
Cincinnati Bickford Tool Co.—Drill, New high speed radial	299
Cincinnati Lathe & Tool Co.—Lathe, Cincinnati tool room	323
Cincinnati Milling Machine Co.—Cincinnati products	327
Cincinnati Milling Machine & Cincinnati Grinders, Inc.—Cincinnati unit center type grinder	124
Miller, New tool room	702
Cincinnati Sheper Co.—Shear speeds production, New Cincinnati	297
City Auto Stamping Co.—City Auto Stamping declare quarterly dividend ..	815
City Auto Stamping workers end strike ..	470
Clark Controller Co.—Welder control, New simple spot	216
Clark Equipment Co.—Clark Co. alters plants to expedite truck job	69
Cleveland Automatic Machine Co.—Cleveland automatic multiple-spindle machines	322
Cleveland Graphite Bronze Co.—Cleveland Graphite 6 months profit	162
Cleveland Hobbing Machine Co.—Rigid-hobber, Spiral bevel	315
Cleveland Punch & Shear Works Co.—Press, New Cleveland trimming	318
Cleveland Tractor Co.—Cleveland Tractor plans million debenture issue	675
Gear inspection, Special appliances used for	85
Cleveland Welding Co.—Cleveland Welding opens Detroit office	101
Clipper Belt Lacer Co.—Belt lacer	301
Collins & Aikman Corp.—Upholstery for cars, New	471
Colt's Patent Fire Arms Mfg. Co.—Cleaning parts in process	303
Columbian Steel Tank Co.—Tanker capacity, Largest road	71
Commercial Credit Co.—CCC rates 6% in several sections now	538
Cone Automatic Machine Co.—Lathe, Conomatic 8 spindle automatic	400
Continental Machine Specialties—Continental sawing and filing machine ..	640
Continental Motor Corp.—Continental revising financial setups	133
Cord Corporation—Cord has Bendix vacuum gear shift in new front drive ..	629

Cord 1936 prices	616
Cord with new system of independent suspension, Front drive	582
Cotta Gear Co.—Four-speed-constant-mesh transmission with direct drive in fourth recommended for lower operating cost	750
Cotta Transmission Corp.—Transmission, Heavy duty	276
Chris-Craft Corp.—Pickell with Chris-Craft	131
R. C. Cross—Cross rotary-valve engine ..	661
Cummins Engine Co.—Cummins' trans-continental economy run	34
Cushman Chuck Co.—Cushmatic chuck ..	327
Cutler-Hammer, Inc.—Clutch, New features in magnetic	156
Standardized machine control	327

D

Dall Manufacturing Co., Inc.—Aluminum Industries buys Dall Mfg. Co.	675
Dalrae Tools Co.—Dalrae speedmill attachment	322
Danly Machine Specialties, Inc.—All-steel die sets produced by Danly methods	93
Dayton-Rogers Mfg. Co.—Device for laying out, checking and drilling dies, New	307
Dayton Rubber Mfg. Co.—Belts for machine tool drives, Oil proof vee	309
DeWalt Products Corp.—Cutting machine will cut at any angle	308
Delco-Remy Corp.—Delco to establish East Coast battery factory	227
Detroit Testing Machine Co.—Brinell machine, New direct reading	398
Devine Brothers Co.—Polishing wheel ..	327
Diamond Machine Co.—Grinder, G-4 surface	315
Diamond T Motor Car Co.—Diamond T new propeller shaft intermediate bearing on rubber	764
Dockson Co., C. H.—Stelco welding tips ..	372
Dodge Bros., Inc.—Dodge dealer advance '36 orders	501
Dodge line, New hood and fender treatment marks the 1936	515
Dodge '36 cars under way	378
Dodge 1936 prices	619
Dodge 2-ton trucks	8
Doehler Die Casting Co.—Doehler announces new brass die-casting alloy ..	379
E. I. duPont de Nemours & Co.—duPont to distribute GM stock as dividend ..	679
Pontine upholstery fabric	638
Duesenberg, Inc.—Jenkins in Duesenberg beats Cobb's mark	346

E

Eastern Machine Screw Corp.—H & G dies of new design	299
Eaton Mfg. Co.—Clutch actuator takes place of the release bearing, New ..	496
Eaton enlarges plants	224
Eaton pays extra dividend	434
Eclipse Aviation Corp.—Automatic transmission, The Eclipse controlled	90
E. Edelmann & Co.—Edelmann enlarges plant	97
Eisler Engineering Co.—Welder and trimmer for flexible shafts	323
Electric Auto-Lite Co.—Auto-Lite acquires bumper and die casting factories	161
Auto-Lite earnings	617
Auto-Lite reports net profit	223
Elec. Auto-Lite centers research for subsidiaries at Toledo plant	632
Elec. Auto-Lite declares regular quarterly dividends	815
Electric Controller & Mfg. Co.—Contactors, New "line-arc" magnetic	562
Electric Furnace Co.—Electric furnace has controlled atmosphere	398

- Electro-Motive Corp.**—GM in production on locomotives in November 133
- Ethyl Gasoline Corp.**—Slushing compound protects aircraft motors, New 808
- Evans Products Co.**—Evans Products add to Detroit plant 508
- Ex-Cell-O Aircraft & Tool Corp.**—Grinder, Ex-Cell-O precision thread 296

F

- Fafnir Bearing Co.**—Bearings, Precision ball 326
- Fansteel Metallurgical Corp.**—Fansteel changes name 378
- Farrel-Birmingham Co., Inc.**—Generating machine has new features, Gear 304
- Farval Corp.**—Farval lubricating system 297
- Federal Motor Truck Co.**—U. S. War Dept. orders 74 trucks from Federal 544
- Federal Products Corp.**—Checking automobile crankshafts 303
- Fellows Gear Shaper Co.**—Gear shaper, Fellows No. 6 hourglass 401
- Felt-Products Mfg. Co.**—Alupak cylinder-head gaskets 366
- R. Y. Ferner Co.**—Readings with dwarf Brinell press, Quick 308
- Finn, William J.**—Influence of compression ratio, barometric pressure and temperature on volumetric efficiency 104
- Firestone Tire & Rubber Co.**—Firestone profits 815
- Fisher Body Corp.**—Fisher Body purchases Murray Wood Tenn. plant 103
- Fisher ready to operate Durant plant in September 194
- Rebuilt Fisher plant at Pontiac in operation 334
- Fiske Bros. Refining Co.**—Lubriplate rights 328
- Ford Motor Co.**—Boiler delivers steam at 900 deg. F., New 225
- Ford blast furnaces now produce 1600 tons daily 191
- Ford develops test set 536
- Fords, Easier steering, all silent transmission, pressed steel wheels feature the new 512
- Ford mill to make parts from soy bean completed 222
- Ford plant, Welding at the 269
- Ford raises prices on six new models 506
- Ford sales in first half 67
- Ford starts erection of two new coke ovens 184
- Ford to build valve factory at Northville 130
- Measuring 2/1,000,000 of an inch 320
- Ford Motor Co. of Canada, Ltd.**—Ford of Canada '36 trucks feature chassis refinements 545
- Fosdick Machine Tool Co.**—Drill, Fosdick 325
- Foster Machine Co.**—Lathe, New cutting alloys require new type 294
- Fostoria Pressed Steel Corp.**—Fostoria, York merge fender operations 184
- Titeseal sealing compound 328
- Four Wheel Drive Auto Co.**—FWD 25 years old 100
- Portable rock crusher by FWD 441
- Roberts and Geffs join Four Wheel Drive staff 223
- Fox Co.**—Fox buys new plant 100
- Foxboro Co.**—Drive unit, Motor 315
- Fruehauf Trailer Co.**—Fruehauf denies outside interests in company 618
- Fruehauf fights Labor Board rule 807
- Fruehauf gets order for trailers 705
- Fruehauf hearings, Conclude 645
- Fruehauf labor case, Hearings under way on 616
- Tank combination, capacity and weight 145
- G**
- Gabriel Co.**—Gabriel in production on new shock absorber 161
- Gabriel-Walex shock absorber 250
- Gallmeyer & Livingston Co.**—Grinder has hydraulic feed, Large surface 320
- Gardner-Denver Co.**—Air compressors, Two-stage 293
- General Aircraft, Ltd.**—General Aircraft gets Hispano-Suiza rights 103
- General Electric Company**—Gauges, G-E electric thickness 460
- General Electric new products 532
- G. E. Tachometer 60
- Headlight bulb, New bar-filament 768
- General Motors Acceptance Corp.**—GMAC announces finance plan 537
- General Motors Export Div.**—GM to build assembly plant at Mexico City 442
- General Motors of Canada, Ltd.**—GM building gas plant 377
- GM to spend money on equipment at Oshawa plant 191
- General Motors Corp.**—duPont to distribute GM stock as dividend 679
- Early shut-downs for new model plan adversely affects GM Sept. sales 469
- Expansion at Tarrytown 340
- Fisher Body plant, Plan Grand Rapids 805
- GM August sales 346
- GM doubles regular dividend rate 158
- GM earnings reflect increased car demand 574
- GM first half earnings 99
- GM leases DeVaux-Hall plant for storage 331
- GM Los Angeles plant works starts Dec. 1 568
- GM 1935 stockholders triple '29 353
- GM's show month sales top records of all previous Januarys, November 783
- GM spending to expand and improve productive facilities 189
- GM to experiment on work stabilization 610
- Japanese, GM hold conference on ownership 434
- Millionth GM car 158
- General Motors Parts Corp.**—Chevrolet constructs new warehouse 257
- General Motors Truck Co.**—GM truck, Officer personnel changes 773
- General Plastics Co.**—Durez material, New 214
- Durez 5331 material 498
- Machining or sanding with Durez material 215
- Durez molding material 843
- Geometric Tool Co., The**—Threading machine, Geometric 309
- Giddings & Lewis Machine Tool Co.**—Miller has directional control, Giddings & Lewis 307
- L. H. Gilmer Co.**—Johns-Manville, Gilmer join in sales agreement 676
- Gisholt Machine Co.**—Gisholt announces three new lathes 768
- Lathe, New Gisholt turret 302
- Gleason Works**—Gear finishing machine, Single cycle 31, 305
- B. F. Goodrich Rubber Co.**—Nukraft upholstery material 803
- Goodyear Tire & Rubber Co.**—Goodyear denies price discrimination charge 383
- Goodyear replies to FTC findings in price case 192
- George Gorton Machine Co.**—Gorton duplicators 399
- Gould & Eberhardt**—Gould & Eberhardt introduce 2 new machines 297
- Graham-Paige Motor Co.**—Graham-Paige concentrates on sixes 600
- Graham 1936 prices 613
- Graham-Paige reports loss 683
- G. A. Gray Co.**—Planer quickly changed to miller 312
- Greenlee Bros. & Co.**—Greenlee hydraulic unit 401
- H**
- Hanna Engineering Works**—Hanna press for spring shackle bushings 460
- Hannifin Mfg. Co.**—Hannifin air operated moulding press 155
- Hannifin sensitive straightening press 151
- Riveter, Light weight feature of Hannifin portable 306
- Hardinge Bros., Inc.**—Milling machine for laboratory 833
- Harnischfeger Corp.**—New heavy duty welders announced 31
- Harris Calorific Co.**—Harris builds plant 19
- R. G. Haskins Co.**—Tapper used for external threading, Haskins 31
- Hayes Body Corp.**—Hayes Body reports quarter loss 102
- Haynes Stellite Co.**—J-metal for high speed cutting tools 30
- Heald Machine Co.**—Bore-Matics, Two new Heald 40
- Heald has many new machines 298
- Heil Company**—Tank combination, capacity and weight 145
- Henry & Wright Mfg. Co.**—Dieing machine, 50 ton 308
- Hercules Motor Corp.**—Diesels in smaller power ranges 688
- Hercules adds 250 cu. in. 6-cyl. diesel 273
- Hercules establishing factory at Muskegon 610
- Hercules gasoline-engine starters for diesels 363
- Hevi-Duty Electric Co.**—Resistors, New material for electric furnace 328
- High Speed Hammer Co., Inc.**—Hammer, 7B riveting 315
- Hill Clutch Machine & Foundry Co.**—Hill buys Canton Foundry 40
- Hisey-Wolf Machine Co.**—Drill grinder, Floor stand 215
- Hobart Brothers Co.**—Arc welder for light gage metal, New 303
- Hoefler Manufacturing Co.**—Drilling units for old machines, Hydraulic feed 300
- Holo-Krome Screw Corp.**—Screws, Fibro-forged 31
- Hoskins Mfg. Co.**—Hoskins declares extra dividend 340
- Houdaille-Hershey Corp.**—Houdaille-Hershey first half profit 69
- Houde Engineering Corp.**—Air-conditioning system now available for motor vehicles 605
- Houde-Carrier air-conditioning system 732
- E. F. Houghton & Co.**—Ferritrol inhibitor for pickling 638
- Houghton products 328
- Hudson Motor Car Co.**—Hudson current ratio 342
- Hudson "Duo automatic hydraulic braking" for '36 550
- Hudson has best half in 5 years 129
- Hudson's initial 1936 car orders, 25,000 434
- Hudson installs new giant presses for roof panels 384
- Hudson promotes Byrne, Powers, Tur-rill, Hadley 249
- Hudson 2nd quarter profit exceeds first 65
- Hudson 1936 prices 576
- Hudson starts '36 output 403
- Terraplanes have longer wheelbase and front axle torque arm 596
- Hupp Motor Corp.**—Andrews blocks Hupp stockholders meeting 345
- Hupp board members; Andrews loses 407
- Hupp case record, U. S. Court grants plea to alter 72
- Hupp directors upheld in Andrews suit, Present 542
- Hupp independent stockholders committee 152
- Hupp management increases output, dealers, New 134
- Hupp '36 bodies and chassis 595
- Hupp proxies asked 194
- Hupp reports 6 mos. loss 163
- Hupp stock proxy commission declines reply to Andrews 331
- Hurlburt to head Hupp sales; Clarke aide 2
- MacDonald to head Hupp sales, get new capital 612
- SEC denies request to delist Hupp stock 9
- Hutto Engineering Co., Inc.**—Honing machine has mechanical drive 313
- Hyatt Roller Bearing Co.**—HY-load type bearing 327
- Hydraulic Press Mfg. Co.**—Press, New features on hydraulic 310

I	<p>Illinois Iron & Bolt Co.—Hot water heater 276</p> <p>Illinois Tool Works—Die-filing machine.. 316</p> <p>Independent Pneumatic Tool Co.—Drill, Light weight Thor 311</p> <p>Thor announces line of balancers 62</p> <p>Indian Motorcycle Co.—Indian Motorcycle adds 4-cyl. model 34</p> <p>Ingersoll Milling Machine Co.—Blades for boring tools, Renewable 772</p> <p>Ingersoll Zee lock side milling cutters 32</p> <p>Ingersoll Zee lock end mills 215</p> <p>Ingersoll-Rand Co.—Ingersoll-Rand Pott impact wrench 62</p> <p>Inland Steel Co.—Vote on steel co. merger 350</p> <p>International Harvester Co.—Harvester buys 42 acres for plant expansion 6</p> <p>Harvester to expand Springfield factory 103</p> <p>Harvester to modernize steel plant in Chicago 503</p> <p>Harvester to spend million revamping E. Moline plant 224</p> <p>International uses 2-speed axles on 3 new truck models 862</p> <p>McCormick, H. F., named Harvester chairman 409</p> <p>International Nickel Co.—Endurance tests of case-hardened gears show varying load capacities 454</p>	<p>Link-Belt Co.—Link-Belt Shafer roller bearings 639</p> <p>Link-Belt transmission 460</p> <p>Link-Belt to move 642</p> <p>Silent and roller chain drives for machine tools 327</p> <p>Littell Machine Co., F. J.—Machine handles sheet stock in coils 324</p> <p>Lodge & Shipley Machine Tool Co.—Automatic lathe for high speed quantity production 397</p> <p>Logansport Machine Co.—Press, Hydraulic forcing 305</p> <p>Lovejoy Tool Works—Lovejoy flexible coupling 63</p>	<p>Norma-Hoffmann Bearing Corp.—"Grea-seal" extends bearing size line 82</p> <p>Norma-Hoffmann bearings sealed 804</p> <p>Norton Company—Grinders, New Norton 300</p>
	<p>J</p> <p>Jaray Streamline Corp. of Amer.—Chrysler buys license under Jaray.. 98</p> <p>Jarvis, Charles L., Co.—Unit, Supra-Biax 321</p> <p>Johns-Manville Sales Corp.—Johns-Manville, Gilmer join in sales agreement 676</p> <p>Johnson Motor Co.—Ni-Resist iron for cylinders 231</p> <p>Jones & Lamson Machine Co.—Lathe, J & L turret 314</p> <p>Jones & Laughlin Steel Corp.—Jones-Laughlin plans expansion 815</p>	<p>M</p> <p>Mack-International Motor Truck Corp.—Macks feature "rollout" power, New traffic type 144</p> <p>Mack truck awarded NYC order 544</p> <p>Macklin Co.—Macklin adds 50% to capacity 197</p> <p>Madison-Kipp Corp.—Madison-Kipp presents new die-casting machine 299</p> <p>P. R. Mallory & Co.—Copper alloy has unusual properties, New 81</p> <p>Marlin-Rockwell Corp.—50,000 r.p.m. 304</p> <p>Marmon-Herrington Co.—Marmon-Herrington converts Ford truck chassis to all-wheel drive 100</p> <p>M-H 4-wheel drive truck test 347</p> <p>Marquette Mechanical Engineering Co.—Marquette diesinking profiling pantograph 60</p> <p>Mattison machine works—Grinders, Mattison surface 322</p> <p>McCord Radiator & Mfg. Co.—McCord payrolls rise, employment gains 73</p> <p>Michigan Tool Co.—Finishing machine for internal gears 562</p> <p>Lapper, Michigan tool gear worm 313</p> <p>"Mitco pin splice" tools 803</p> <p>Millholland Sales & Mfg. Co.—Drilling unit, Improvements in Millholland lathe 833</p> <p>Quick speed changes on Millholland lathe 319</p> <p>Minter, Clark C.—Influence of compression ratio, barometric pressure and temperature on volumetric efficiency 104</p> <p>Mitchell Specialty Co.—Williams president of Mitchell Specialty 96</p> <p>Modern Equipment Corp.—Modern Equipment factory at Defiance, O. 100</p> <p>Modine Manufacturing Co.—Modine unit coolers 323</p> <p>Monarch Machine Tool Co.—Lathes, Monarch presents several new 311</p> <p>Monroe Auto Equipment Co.—Monroe goes to volume production on group of specialized parts 793</p> <p>Monroe products, New 768</p> <p>Moto Meter Gauge Corp.—Auto-Lite to dissolve Moto Meter Gauge 411</p> <p>Motor Improvements, Inc.—Filters for coolants and cutting oils 321</p> <p>Water and oil separator 497</p> <p>Murray-Ohio Mfg. Co.—Murray files data with SEC for new share issue 501</p> <p>Murray-Ohio plans bond retirement 385</p> <p>Motor Products Corp.—Motor Products net profit 73</p>	<p>O</p> <p>Oakite Products, Inc.—Oakite for cleaning parts 326</p> <p>Ohio Carbon Co.—Carbon resistor for electronic control 93</p> <p>Oilgear Co.—Broaching machine 326</p> <p>O. K. Tool Co.—Improvements made in cutting tools 319</p> <p>Olds Motor Works—Olds adopts aluminum pistons and improves engine mounting 553</p> <p>Olds and Fisher Lansing plant operations at peak 837</p> <p>Olds 1935 output 379</p> <p>Oldsmobile output for '35 435</p> <p>Oliver Instrument Co.—Grinder, New full automatic face mill 295</p> <p>Oster-Williams Co.—Bolt machine, New high production 306</p>
	<p>K</p> <p>Kearney & Trecker Corp.—Milling machine for small parts, Production... 373</p> <p>Kellogg Compressor & Mfg. Corp.—Kellogg reorganized 645</p> <p>Kelsey-Hayes Wheel Corp.—Kelsey-Hayes building new foundry in Detroit 126</p> <p>Kent-Owens Machine Co.—Cam controlled table feed 302</p> <p>Kent-Owens No. 26 milling machine 94</p> <p>Kingsbury Machine Tool Corp.—Kingsbury fleximatic 398</p>	<p>N</p> <p>Nagle & Sons, Inc., James E.—Nagle & Sons acquires larger Toledo plant .. 197</p> <p>Nash Motors Company—LaFayette drive on low-priced market, Huge advertising campaign launches 131</p> <p>LaFayette price range; 6 body styles .. 1</p> <p>Nash offerings, Three new models supplement earlier 603</p> <p>Nash offers overdrive on "400" at extra cost 40</p> <p>Nash prices, 1936 576</p> <p>Nash ships cars by boat 441</p> <p>National Acme Co.—National Acme 4 spindle automatic chucking machine 402</p> <p>Single spindle automatic cuts costs.. 292</p> <p>National Auto Products Co., Inc.—New automotive products company 220</p> <p>National Tool Co.—Gears with improved gear finishers, Quieter 326</p> <p>Neon-Arowlite, Inc.—Neon turn signal 214</p> <p>New Britain-Gridley Machine Co.—Screw machines, Automatic 326</p> <p>Screw machines, New high speed automatic 151</p> <p>New Departure Mfg. Co.—Transitorq 327</p> <p>Niagara Machine & Tool Works—Clutch, A new sleeve type 155</p> <p>Press, Niagara adds inclinable 562</p> <p>Work automatically clamped on Niagara shears 325</p>	<p>P</p> <p>Packard Motor Car Co.—Christopher heads Packard production 127</p> <p>Overhead, management and modernization 483</p> <p>Packard estimated car production in '36 407</p> <p>Packard expanding output facilities... 73</p> <p>Packard first half profit 99</p> <p>Packard has installed completely mechanized heat treating units 761</p> <p>Packard makes profit in 2nd quarter. 66</p> <p>Packard 120-B more powerful 424</p> <p>Packard's schedule biggest in history 437</p> <p>Packard 12 manifolding and valve take-up 449</p> <p>Parker Rustproof Co.—Parker Rustproof 6 mos. profit 134</p> <p>Parker third quarter profit 439</p> <p>C. F. Pease Co.—Mercury blueprinting machine 327</p> <p>Pellow Machine Co.—Universal sheet metal working machine 327</p> <p>Perfect Circle Co.—Perfect Circle cuts piston ring prices 132</p> <p>Philadelphia Drying Machinery Co.—Mixing valve for uniform flow, New .. 215</p> <p>Pierce-Arrow Motor Car Co.—P-A adds 9 and 15-pass. commercial models.. 130</p> <p>P-A balance sheet 152</p> <p>Pierce-Arrow 1936 new car prices 611</p> <p>Pierce-Arrow offers eights and twelves 604</p> <p>Plaskon Co., Inc.—Toledo Synthetic Products, Inc. to change name to Plaskon Co., Inc. 839</p> <p>Plymouth Motor Company—Plymouth cars, More than 400 rubber parts feature new 502</p> <p>Plymouth designs new frame to resist twisting force 491</p> <p>Plymouth estimated yearly production; new models Oct. 26 437</p> <p>Plymouth improves its steering gear and front suspension for '36 548</p> <p>Plymouth 1936 prices 543</p> <p>Plymouth plans 4 additions to plant .. 129</p> <p>Plymouth to build 4 Detroit plant additions 8</p> <p>Pontiac Motor Car Co.—Pontiac line, Nineteen body styles on three models make up new 516</p> <p>Pontiac moving offices 194</p> <p>Pontiac's new rust-proofing process handles parts for 90 cars per hr. 473</p> <p>Pontiac 1936 prices 537</p> <p>Pontiac revamps iron foundry for re-opening 383</p> <p>Pontiac schedules for '36 468</p> <p>Porter-Cable Machine Co.—Hydraulic control added to new Porter-Cable lathe 301</p> <p>Potter & Johnston Machine Co.—P & J spindle automatic 292</p> <p>P & J automatic chucking machine.. 93</p> <p>Pratt & Whitney Co.—Borer speeds production, New jig 314</p> <p>Cutters, New high speed die sinking .. 217</p> <p>P & W tilting rotary table 372</p> <p>P & W to designate engines by cruising power rating 97</p> <p>Reamer with serrated blades 372</p> <p>Prest-O-Lite Storage Battery Co.—McDuffee president of Prest-O-Lite... 34</p> <p>Producto Machine Co.—Producto-Matic miller just announced 306</p> <p>Prosser & Son, Thos.—Cutting tools, High speeds and heavy cuts with new 309</p> <p>Pyrene Mfg. Co.—Extinguisher, New Pyrene pressure 371</p>
	<p>L</p> <p>Lammert & Mann Co.—Lammert control valve 462</p> <p>Landis Machine Co., Inc.—Landis model O chaser grinder 63</p> <p>Taps, Extension link for collapsible .. 94</p> <p>Threading machine has hydraulic control, New 318</p> <p>Work aligning and indexing fixture.. 638</p> <p>Landis Tool Co.—Grinder with automatic sizing, Hydraulic 298</p> <p>Landis Hydraulic grinding machines.. 123</p> <p>Langlier Manufacturing Co.—Drill has speed of 8000 r.p.m. 318</p> <p>Lanova Corp.—Lanova Corp. opens N. Y. offices 101</p> <p>R. K. LeBlond Machine Tool Co.—Lathe for cemented carbide tools, High-speed 316</p> <p>Lehmann Machine Co.—Lathe, Automatic slide rule on "Hydratrol" 296</p> <p>Leland-Gifford Co.—Leland-Gifford Co. exhibits new products 399</p> <p>Libbey-Owens-Ford Glass Co.—L-O-F gets safety glass order for 2000 bugs L-O-F new plant addition to facilitate production 6</p> <p>L-O-F reports net profit 72</p> <p>Lincoln Electric Co.—AC welder announced by Lincoln 373</p> <p>Automatic motor starter 327</p> <p>Cable connector, Quick detachable ... 804</p> <p>Lincoln welder, New 200 amp. 671</p> <p>Lincoln Motor Car Co.—Lincoln-Zephyr a V-12 on 122 wb. 592</p> <p>Lincoln "Zephyr" prices 568</p> <p>Linde Air Products Company—General duty welding torch 460</p> <p>Linde announces stainless welding rod 385</p> <p>Linde to conduct two welding clinics .. 472</p> <p>Oxweld acetylene generator 670</p> <p>Welding torch, New general duty ... 156</p> <p>Linderman Devices, Inc.—Linderman brake system, Fluid actuation feature of new 245</p>	<p>O</p> <p>Norma-Hoffmann Bearing Corp.—"Grea-seal" extends bearing size line 82</p> <p>Norma-Hoffmann bearings sealed 804</p> <p>Norton Company—Grinders, New Norton 300</p>	<p>P</p> <p>Packard Motor Car Co.—Christopher heads Packard production 127</p> <p>Overhead, management and modernization 483</p> <p>Packard estimated car production in '36 407</p> <p>Packard expanding output facilities... 73</p> <p>Packard first half profit 99</p> <p>Packard has installed completely mechanized heat treating units 761</p> <p>Packard makes profit in 2nd quarter. 66</p> <p>Packard 120-B more powerful 424</p> <p>Packard's schedule biggest in history 437</p> <p>Packard 12 manifolding and valve take-up 449</p> <p>Parker Rustproof Co.—Parker Rustproof 6 mos. profit 134</p> <p>Parker third quarter profit 439</p> <p>C. F. Pease Co.—Mercury blueprinting machine 327</p> <p>Pellow Machine Co.—Universal sheet metal working machine 327</p> <p>Perfect Circle Co.—Perfect Circle cuts piston ring prices 132</p> <p>Philadelphia Drying Machinery Co.—Mixing valve for uniform flow, New .. 215</p> <p>Pierce-Arrow Motor Car Co.—P-A adds 9 and 15-pass. commercial models.. 130</p> <p>P-A balance sheet 152</p> <p>Pierce-Arrow 1936 new car prices 611</p> <p>Pierce-Arrow offers eights and twelves 604</p> <p>Plaskon Co., Inc.—Toledo Synthetic Products, Inc. to change name to Plaskon Co., Inc. 839</p> <p>Plymouth Motor Company—Plymouth cars, More than 400 rubber parts feature new 502</p> <p>Plymouth designs new frame to resist twisting force 491</p> <p>Plymouth estimated yearly production; new models Oct. 26 437</p> <p>Plymouth improves its steering gear and front suspension for '36 548</p> <p>Plymouth 1936 prices 543</p> <p>Plymouth plans 4 additions to plant .. 129</p> <p>Plymouth to build 4 Detroit plant additions 8</p> <p>Pontiac Motor Car Co.—Pontiac line, Nineteen body styles on three models make up new 516</p> <p>Pontiac moving offices 194</p> <p>Pontiac's new rust-proofing process handles parts for 90 cars per hr. 473</p> <p>Pontiac 1936 prices 537</p> <p>Pontiac revamps iron foundry for re-opening 383</p> <p>Pontiac schedules for '36 468</p> <p>Porter-Cable Machine Co.—Hydraulic control added to new Porter-Cable lathe 301</p> <p>Potter & Johnston Machine Co.—P & J spindle automatic 292</p> <p>P & J automatic chucking machine.. 93</p> <p>Pratt & Whitney Co.—Borer speeds production, New jig 314</p> <p>Cutters, New high speed die sinking .. 217</p> <p>P & W tilting rotary table 372</p> <p>P & W to designate engines by cruising power rating 97</p> <p>Reamer with serrated blades 372</p> <p>Prest-O-Lite Storage Battery Co.—McDuffee president of Prest-O-Lite... 34</p> <p>Producto Machine Co.—Producto-Matic miller just announced 306</p> <p>Prosser & Son, Thos.—Cutting tools, High speeds and heavy cuts with new 309</p> <p>Pyrene Mfg. Co.—Extinguisher, New Pyrene pressure 371</p>

R

Rasmussen Machine Co., Inc.—New machine company	384
Raybestos-Manhattan, Inc.—Raybestos-Manhattan acquires Multibestos	349
Raybestos-Manhattan reports income	227
Red Cap Battery Co.—Battery company sold	505
Reed-Prentice Corp.—Die casting machine	326
Die casting machine, Full hydraulic	214
Lathe, New precision tool room	398
Reeves Pulley Co.—"Hydraumatic" control for Reeves transmissions	301
Reo Motor Car Company—Reo earnings	127
Reo given government order	707
Reo line for '36	591
Reo 1936 prices	612
Reo, Studebaker, announce low rate financing plan	674
Reo 3rd quarter profit	505

Republic Steel Corp.—Republic consolidates offices in Cleveland	469
---	-----

Rex Products & Mfg. Co.—Rex degreasing machine uses "Perm-a-clor" solvent	400
---	-----

Reynolds Spring Co.—Reynolds Spring reports profit	227
Reynolds Spring to open Detroit plant	344

Rivett Lathe & Grinder Corp.—Lathe, Rivett open-head	314
--	-----

David J. Ross Co.—Safety device for punch presses	372
---	-----

Rotor Air Tool Co.—Electric tools speed production, High-cycle	325
--	-----

Roxalin Flexible Lacquer Co.—Lacquer finish stretches like rubber, New	131
Roxalin has new finishes	329
Roxalin office, New	101

Ryerson & Son, Inc., Joseph T.—Ryerson plant addition completed in Jersey City	505
--	-----

S

A. Schrader's Son, Inc.—Schrader quick acting couplers	276
Tire inflation system is developed, Continuous	276

Scintilla Magneto Co., Inc.—Scintilla aircraft battery ignition	630
Scintilla enlarges plant	194

Seaman Body Co.—Seaman Body Aug. output	252
---	-----

Seamless Rubber Co.—Masking tape combines advantages	329
--	-----

Self-Vulcanizing Rubber Co., Inc.—Rubber covering, New	94
--	----

William Sellers & Co.—Sellers drill grinding machine	401
--	-----

Seneca Falls Machine Co.—Lathe, Seneca Falls speedcut	294
---	-----

Shepard Niles Crane & Hoist Corp.—Push button control for cranes & hoists	327
---	-----

Shuler Axle Co., Inc.—Potter elected Shuler president	256
---	-----

Simplex Products Corp.—Simplex Piston Ring Co. now Simplex Products Corp.	355
---	-----

SKF Industries, Inc.—Spindles	327
-------------------------------------	-----

Sparks-Withington Co.—Sparks-Withington reports loss	408
--	-----

Sperry Products, Inc.—Sperry Adher-O-Scope	702
--	-----

Spicer Mfg. Corp.—Spicer Co.—MESA sign new contract	348
---	-----

Sponge-Aire Seat Co.—Sponge-Aire Co. seats in White 704 trucks	474
--	-----

Stanley Works—Unishear, New Portable	462
--	-----

Starrett Co., L. S.—Precision tools	327
Starrett acquires business of Henry A. Lowe Co.	815

Sterling Motor Truck Co.—Tank combination, capacity and weight	145
--	-----

Stewart-Warner Corp.—Stewart-Warner earnings for 3 months	8
Stewart-Warner 6 months net profit	103

Stout Engineering Laboratories—Stout announces a new Scarab	601
Stout steps-up production; making experimental run	805

Stow Manufacturing Co.—Power unit, New Stow	372
---	-----

D. A. Stuart & Co.—Testing machines ..	326
--	-----

Studebaker Corporation—Studebaker loss small; working capital increases	131
Studebaker loss, Early new model dates cause	618
Studebaker plans West Coast assembly plant	247
Studebaker, Reo, announce low rate financing plan	674
Studebaker ships carloads of vehicles abroad	318
Studebaker six and eight for '36	586
Studebaker West Coast subsidiary to make cars, trucks for Pacific trade, New	501

Studebaker Export Corp.—Studebaker Sept. exports higher	471
---	-----

Studebaker Sales, Inc.—Studebaker takes over Milwaukee distributor	40
--	----

Sunstrand Machine Tool Co.—Miller for small parts, High-speed	312
---	-----

Synthane Corp.—Synthane for silent gears	329
--	-----

Systematic Co.—Control for swivel table grinders	151
--	-----

T

C. J. Tagliabue Mfg. Co.—Controller, Tag No. 40	496
---	-----

Taylor Mfg. Corp.—Dynamometer, Taylor water	562
---	-----

Technical Coatings, Inc.—Impervious films, New coatings produce	702
---	-----

Ternstedt Mfg. Co.—Ternstedt production highspots	42
---	----

Thermoid Company—Thermoid sales gain	380
--	-----

Thompson Grinder Co.—Grinder, New hydraulic surface	300
---	-----

Thompson Products, Inc.—DePaolo will travel for Thompson Prod., Inc.	841
---	-----

Nitrided cylinder liners	694
Thompson piston pin plant, Strike shuts	132

Thompson piston pin strike deadlocked	165
Thompson Prod.—Toledo Steel affiliate; plan new stock issue	815

Valve, Thompson aerotype	833
--------------------------------	-----

Thomson-Gibb Electric Welding Co.—Portable gun welder	326
---	-----

Seam welder produces 30 ft. of fuel feed tubing per minute	660
--	-----

Tillotson Mfg. Co.—Tillotson downdraft carburetor has velocity control	211
--	-----

Timken Roller Bearing Co.—Demonstration of bearing accuracy	327
---	-----

Timken bearings improved, Surface finish of	366
---	-----

Timken declares 50c extra	161
Timken gets P.R.R. order	442

Timken seeks stay of ICC freight rate order	193
---	-----

Toledo Machine & Tool Co.—Toledo press rated at 800 tons	48
--	----

Press, Improved Toledo	563
------------------------------	-----

Toledo Scale Co.—Toledo scales	301
--------------------------------------	-----

Toledo Steel Products Co.—Thompson Prod.—Toledo Steel affiliate; plan new stock issue	815
---	-----

Tomkins - Johnson Co.—Tomkins - Johnson clincher	670
--	-----

Torque Distributor Co.—Differential, New substitute for the	459
---	-----

Torrington Co.—Torrington - Banta m merger announced	410
--	-----

Trimson Mfg. Co.—Portable surfer	62
--	----

Triplex Machine Tool Corp.—Thread grinder, Tool room	155
--	-----

Truck Equipment Co., Inc.—Variable rate spring provided by new torsion bar suspension using rigid axles	54
---	----

Tuthill Pump Co.—Pump, Model RC	315
---------------------------------------	-----

U

Udylite Co.—Plating machine, Semi-automatic	833
Plating unit, Low cost	156
Udylite products	771

United Air Lines Transport Corp.—United Air Lines Transport reports net income	683
--	-----

United Aircraft Mfg. Corp.—United Aircraft companies consolidate into one corp.	3
--	---

United Chromium, Inc.—United Chromium develops improved stop-off lacquer	257
--	-----

United States Rubber Products, Inc.—Bonded rubber-to-metal parts for automobiles, etc.	822
---	-----

Rubber's automotive usefulness, Research steadily broadening	368
Universal Parts Mfg. Corp.—Universal must drop "Mfg."	38

V

V & O Press Co.—Press, V & O high-speed notching	326
--	-----

Vanadium - Alloys Steel Co.—Cutting tools, New high-speed	310
---	-----

Van Norman Machine Tool Co.—Swiveling cutterhead on Van Norman universal miller	324
---	-----

Vauxhall Motors, Ltd.—British GM unit to share 10% of net	222
---	-----

Vickers, Inc.—Transmission, Hydraulic variable speed	326
Vickers hydraulic variable-speed transmission	123

Victor Mfg. & Gasket Co.—Victor enlarges plant for gasket production	377
--	-----

W

O. S. Walker Co.—Chuck, Swiveling magnetic	293
--	-----

Warner & Swasey Company—Broader adaptability feature of new machine tools	282
---	-----

Lathe, W & S universal turret	321
Warner-Swasey heavy bar turning attachment	276

John Warren Watson Co.—Watson dampers give smoother ride	802
--	-----

Waukesha Motor Co.—Waukesha offers Hesselman engine for trucks	267
--	-----

Welding Timer Corp.—Welco welding timer	768
---	-----

Wesson Co.—Grinding machine, Wesson has double end Diamond	312
--	-----

Westinghouse Electric & Mfg. Co.—Electric-dynamic balancing equipment suited to use in automotive production	394
--	-----

Time meter, New total	124
Westinghouse contactors for machine tools	317

Westinghouse to celebrate 50th yr.	845
---	-----

Wheelco Vacuum Products Co.—Temperature limit control	638
---	-----

White Company—White gets Cleveland order for buses	347
--	-----

S. S. White offices, New	412
White truck streamlined	365

Whitney Chain & Mfg. Co.—Whitney will change corporate name	843
---	-----

Wickes Brothers—Lathe, Center drive crankshaft	244
--	-----

Whitney Metal Tool Co.—Power press run from elec. light socket	310
--	-----

Wico Electric Co.—Magneto, Series AP Wico	371
---	-----

Wilkening Mfg. Co., The—Pedrick sealed-channel compression ring	460
---	-----

Piston ring, New Pedrick	329
--------------------------------	-----

Williams Oil-O-Matic Heating Corp.—Refrigeration for perishable goods	804
---	-----

J. H. Williams & Co.—Threading-tool holder	312
--	-----

Willys-Morrow Co.—Creditor would halt Willys-Morrow sale	221
--	-----

Willys-Morrow auction postponed	348
Willys hearing	101

Willys-Morrow Co. plant auction approval asked	191
--	-----

Willys-Morrow plant sold	545
--------------------------------	-----

Willys-Overland Co.—Court expected to OK more W-O cars	103
--	-----

Operations on Willys cars begin	251
Willys, Court approval for more	1

Willys gets Court OK to build more cars	129
---	-----

W-O bondholders get offer	703
---------------------------------	-----

Willys-Overland has six body styles	590
---	-----

W-O 1936 prices	613
-----------------------	-----

Wilson Foundry—Wilson foundry reopening	188
---	-----

Worthington Pump & Machinery Corp.—Compressor operates from truck engine	465
--	-----

Y

Yale & Towne Mfg. Co.—Yale "Pul-Lift"	298
---	-----

Yellow Cab Company—Yellow cab wheel-base, New	67
---	----

Yellow Truck & Coach Mfg. Co.—Babcock heads Yellow	219
--	-----

Yellow gets rear engine patent	87
Yellow Truck & Coach reports 1st half profit	134

L. A. Young Spring & Wire Corp.—Young first half profit	69
---	----

Young Corp. completes new Chicago factory	350
---	-----

Z

Zenith-Detroit Corp.—Zenith adds to plant	225
---	-----

Index of ASSOCIATIONS Mentioned in Automotive Industries

ASSOCIATIONS

AMERICAN AUTOMOBILE ASSN.—
Henry reelected president of AAA . 709

AMERICAN PETROLEUM INSTITUTE
—Significance of added agents to motor lubricants questionable API told 641
Survey classifies registered cars by age groups and fuel requirements... 728

AMERICAN TRADE ASSN. EXECUTIVES—Johnson elected president of trade assn. executives 477

AMERICAN TRUCKING ASSN.—ATA to employ cost plus basis for filing rate, tariffs under carrier act 507
ATA votes fund to continue assn. 7

AUTOMOTIVE SERVICE INDUSTRIES
—Automotive Association elections at ASI show 780

BRAKE LINING MFRS. ASSN.—Williams to head Brake Lining Assn. ... 442

HARVARD UNIVERSITY BUREAU FOR STREET TRAFFIC RESEARCH—Harvard Traffic Bureau gets money from AMA 812

INTERNATIONAL ACETYLENE ASSN.
—Acetylene Assn. to hold convention in Cleveland 614
Acetylene welders 686

MOTOR & EQUIPMENT MFRS. ASSN.
—Rogers to retire as NEMA pres., dinner Dec. 10 476

NATIONAL ASSN. OF TAXICAB OWNERS—Cab owners elect Hubler 545

NATIONAL AUTOMOBILE DEALERS ASSN.—NADA closes capital office 163
NADA dealers (average 359 members) lose \$14.76 per new car..... 127
NADA directors called to consider by-law changes 385
NADA directors cancel annual meeting at Detroit; plan regional conferences 472
NADA flays FOB price advertising as misrepresentation for delivered prices 187
NADA optimistic over factory-dealer relationships 2
NADA reports dealer's net "operating" profit 353
NADA's trade practice application to FTC pends 500
Used car guide proposal, Majority of makers give conditional OK to NADA 650

NATIONAL BATTERY MFRS. ASSN.
—National Battery makers elect Raycroft president 545

NAT. METALS EXPOSITION & NAT. METAL CONGRESS—Automotive production plays prominent role at metal congress 450

NATIONAL STANDARD PARTS ASSN.
—"All Honest Parts Genuine" new NSPA sign proclaims 346
NSPA Convention program aims at aggressive action 477
NSPA elects 18 new firms to membership 380

SOCIETY OF AUTOMOTIVE ENGINEERS—Butane, Diesel fuel discussions feature SAE regional meeting, 674
Chinese "SAE" organized in Shanghai 36
SAE forms section in Hartford district 840
Teetor named for SAE presidency ... 375
Tractor and Transportation activities of SAE hold annual meeting in Chicago 529

UNITED STATES CHAMBER OF COMMERCE—USCC seeks industry's attitude on legislation 504

WHOLESALE NATIONAL FEDERATION—Wholesalers National Federation proposed to preserve benefits under NRA Code 467

